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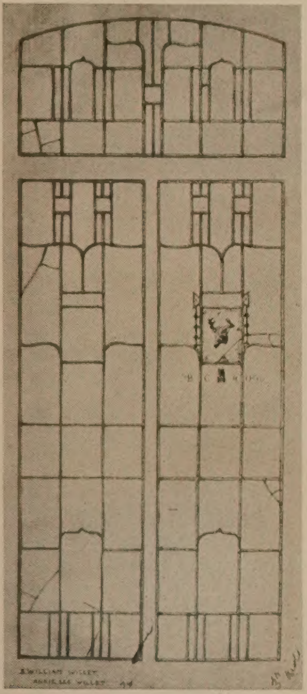
Stained-Glass Methods Old and New

By W. E. Roberts

STAINED glass has a more diversified number of exponents than any other form of decorative art, and it has been described as the harmony of architecture. Many discordant tones are, however, struck in the attempts to revive mediævalism.



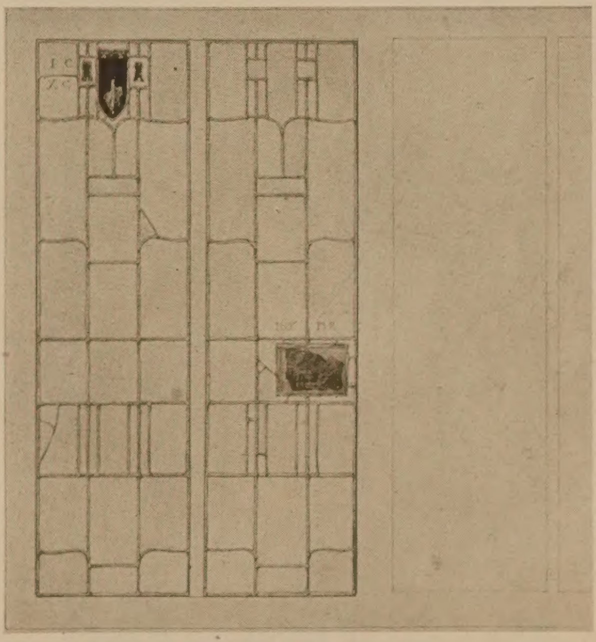
The trouble is chiefly caused by overenthusiasm coupled with a want of experience in the practice of the craft.

The considerable number of people interested in stained glass for the interest it gives proves that the study of glass is fascinating, and any one who has been privileged to see and study the early glass has been stimulated to increase his knowledge by reference to authorities on the subject. This would be well if it did not go any further, but the evil that results is due to the fact that some of these people with their enthusiasm blinding their better judgment literally try to force their opinions down people's throats.

It is easy to imagine what would have been the effect on the world's art had these enthusiastic but misguided people lived in the thirteenth century; probably Gothic art would never have been; the thirteenth-century artists would be copying Chaldean, Egyptian, or Grecian art; in fact, it is possible they might have reintroduced prehistoric art. Looking over the history of art, we find that every age has a style peculiar to that age, and although in some cases it may have been influenced by a preceding age its characteristics were its own. Confining ourselves to the Gothic Age, we do not find the fourteenth-century artist servilely copying the work of the thirteenth-century artist, nor the fifteenth-century artist copying from the fourteenth. Yet we are asked to make imitations of thirteenth-century glass.

The study of mediæval glass is very necessary to any one taking up stained glass professionally, and the study is not easily acquired. Yet people have been known to take a three months' tour of the European cathedrals, returning home as authorities on Gothic glass. What state of mind a person has who believes such a thing possible it is hard to conceive, and in these days of rapid transit it takes considerable imagination to form any idea of the amount of patient labor that was necessary to complete some of the large early windows. The limitations the artists had to contend with, and although time has added a charm that cannot be reproduced by man, the simple faith of the one who gave his best is evident throughout the different periods of early glass.

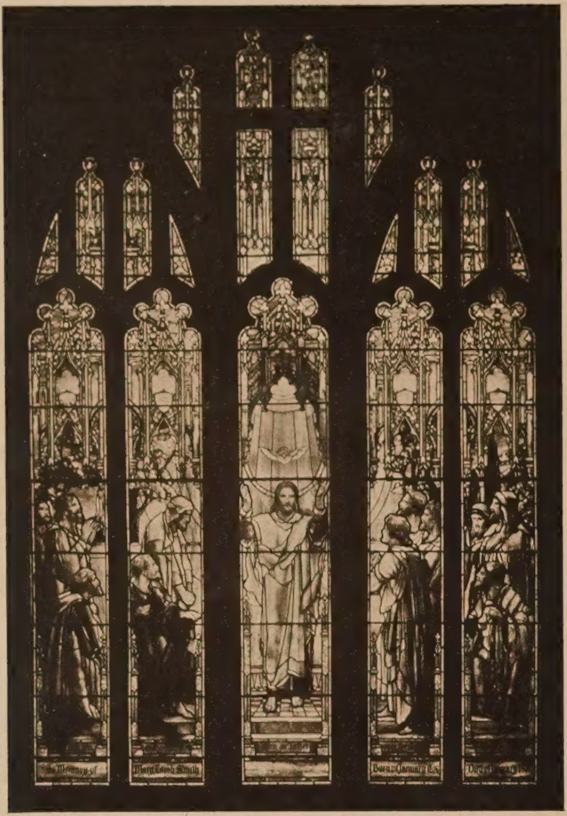
We in this country have not any mediæval glass, and prior to the advent of opalescent glass most of the stained



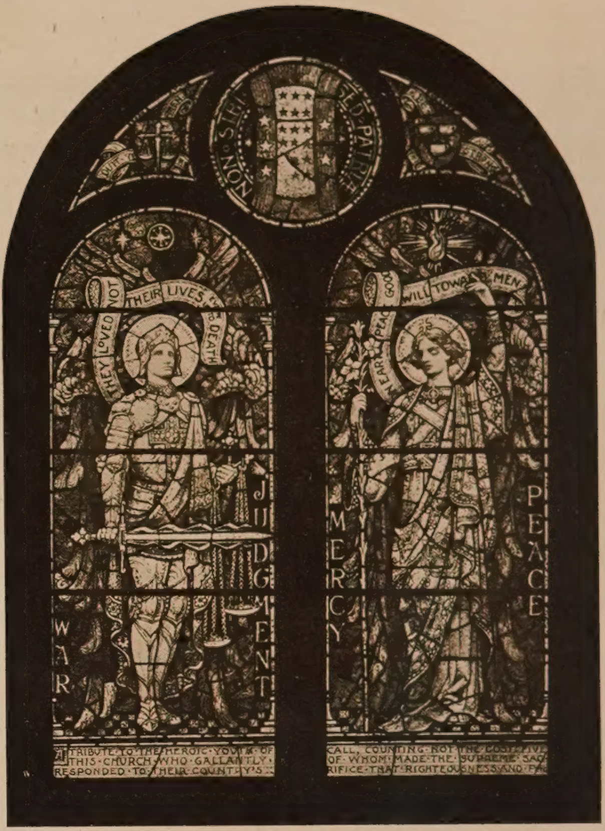
GLASS DOORS AND PARTITIONS

SAMUEL F. HOUSTON'S RESIDENCE, DRUM MUIR, CHESTNUT HILL, PHILADELPHIA
William Willet and A. L. Willet, Brockie & Hastings, Architects

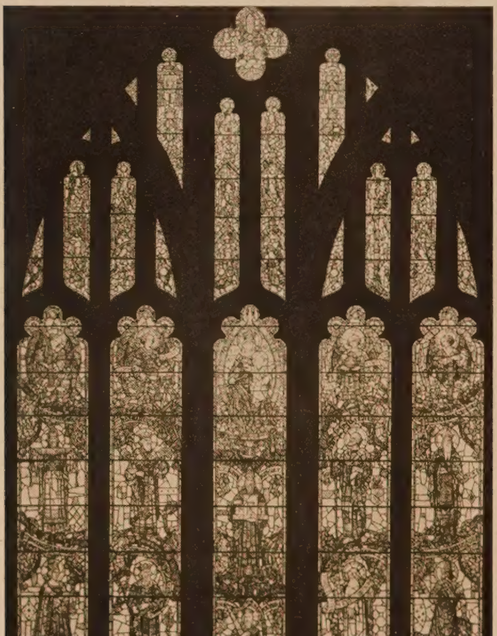
This series of glass doors and partitions is carried out in crystal plate and the mediæval hand-run leading and give a delightful effect of openness and space and light. The inserts of painted glass are unusual. Mr. and Mrs. Houston were interested in the excavations at Nippur and conceived the idea of producing in imperishable glass some of the objects of ancient art which were discovered by the explorations conducted there by the University of Pennsylvania. The Nippur stone and the head of a bull from the oldest known picture in the world, 4000 B. C., are among the inserts in the glass partition leading into the conservatory, while the exquisitely tinted vases and jars found there are reproduced in the dining-room lights.



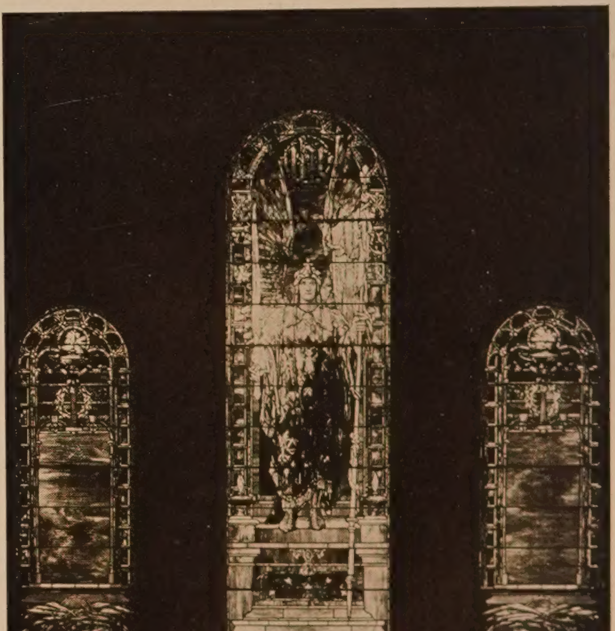
"Christ, the Holy Comforter." Erected in the Church of the Holy Comforter, Charlotte, N. C. By Tiffany Studios.



Design for Victory window, St. Philip's Church, Garrison's on the Hudson, N. Y. William Willet and A. L. Willet, artists. Hobart B. Upjohn, architect.



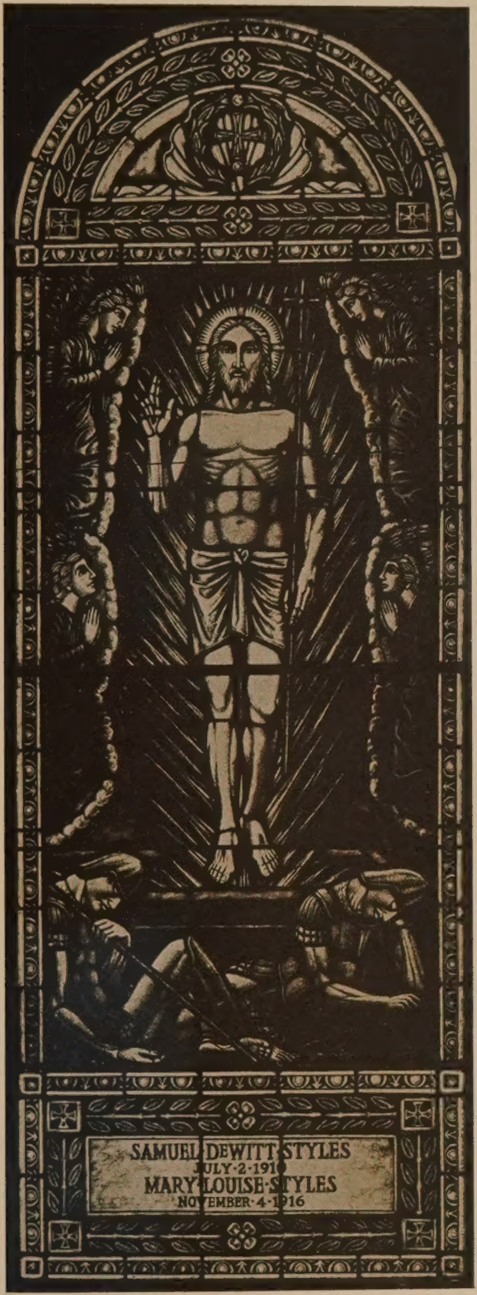
Design for Lady Chapel window, Blessed Sacrament Church, Detroit, Mich. By William Willet and A. L. Willet. Henry A. Walsh, architect.



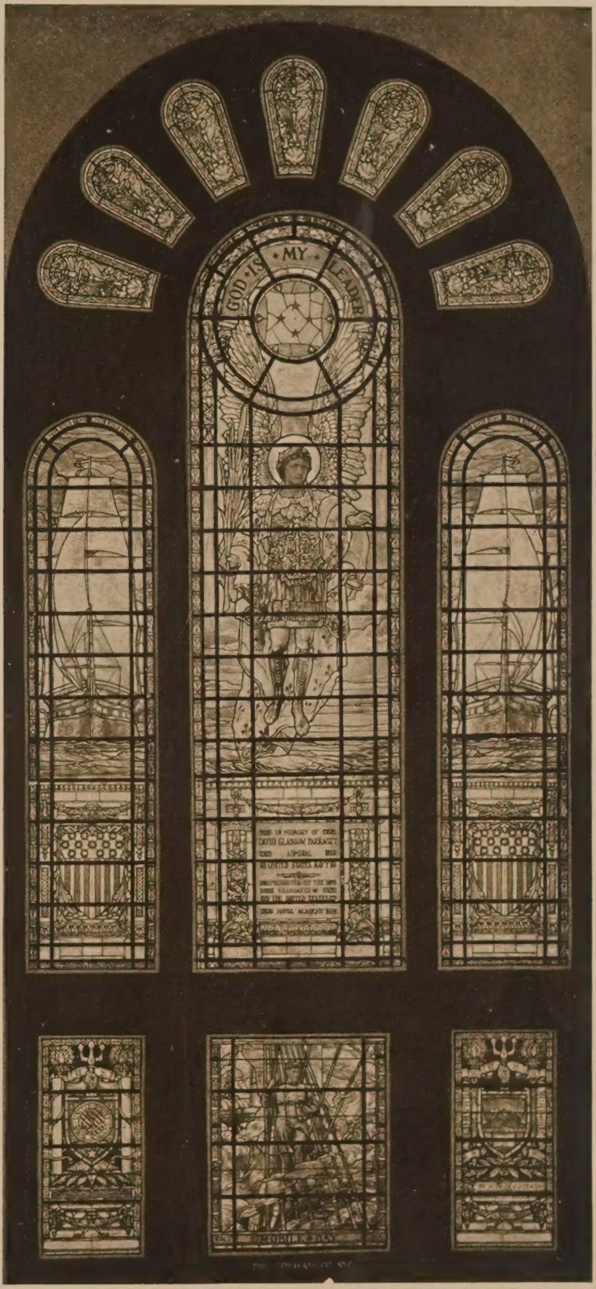
"St. Michael," World War memorial, St. John's M. E. Church, New Rochelle, N. Y. By Tiffany Studios.

glass in our churches had to be imported, and although it was a time when glass was treated in a decadent manner through overpainting or the misuse of enamel colors, a great deal of it compares favorably with the best work done to-day.

Local glass firms to compete against the imported glass obtained glass-workers from Europe, principally from Munich, men who were accustomed to the use of that makeshift for leading, enamel painting. Prospective clients were shown how unnecessary it was to import memorial windows when there were European glass artists in the country more capable of doing work suitable to the conditions here.



"Resurrection," Apse of St. Agnes Chapel, New York. By Oliver C. Smith. (Heinigke & Smith.)

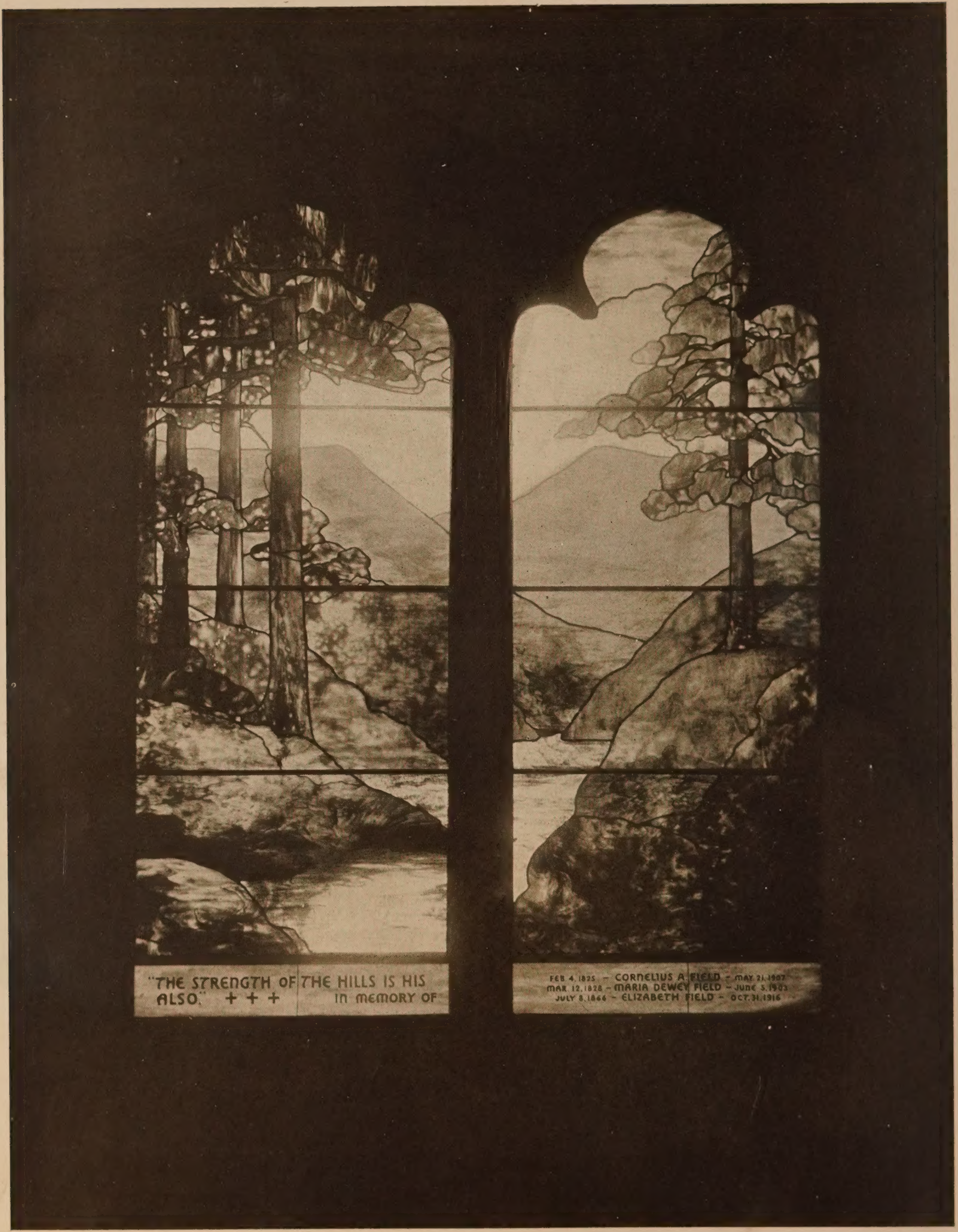


The Farragut memorial window in the Chapel of the United States Naval Academy at Annapolis, Md. Presented by the graduates. By the Gorham Co.

This was partly successful, and in the struggle to check further importations some one conceived the idea of modelling the glass while in a plastic condition, giving it a suggestion of drapery fold and, by mixing the various colored glass in a molten state, produced opalescent glass.

In early mediæval glass, technique was consistent in all the different periods, and if it is now to be ignored, why attempt to revive the study of early glass? Suggestion of natural forms by light and shade do enhance the beauty of glass, so any attempt to produce an effect by labor-saving will merit its own reward.

Artistic license is permissible sometimes, but when it becomes the rule rather than the exception it is something to be shunned. Sensationalism has become a feature here and there, but if we would develop and maintain a standard, these tendencies should be checked.


"THE STRENGTH OF THE HILLS IS HIS
ALSO." + + +
IN MEMORY OF
FEB 4. 1825 – CORNELIUS A. FIELD – MAY 21. 1907
MAR 12. 1828 – MARIA DEWEY FIELD – JUNE 5. 1903
JULY 8. 1866 – ELIZABETH FIELD – OCT. 31. 1916

"LANDSCAPE" ERECTED IN PILGRIM CONGREGATIONAL CHURCH, DULUTH, MINN. By Tiffany Studios.

Construction of the Small House

By H. Vandervoort Walsh
Instructor in Architecture, School of Architecture, Columbia University

ARTICLE VI

CONSTRUCTION OF THE MASONRY-AND-WOOD DWELLING

IN one of the previous articles it was pointed out that the type of construction next in general use to that of the wooden-frame house was the dwelling of masonry and wood. This was designated as Type II, and defined as a building with exterior walls of stone, brick, concrete, or terra-cotta, and interior floors and partitions of wooden-frame construction.

The difference in construction between the wooden-frame structure and the masonry-and-wood building is mostly in the material used for the exterior walls. The interiors of both types are constructed in practically the same way, the floors being of light wooden joists and the partitions of wooden studs.

The oldest varieties of the masonry houses in America are represented by the stone and brick dwellings of Colonial days. These are so substantially built, and often so artistic in conception, that they have become common models from which to draw inspiration. The concrete house of the monolithic or block type, and that of hollow terra-cotta tile, is a modern development.

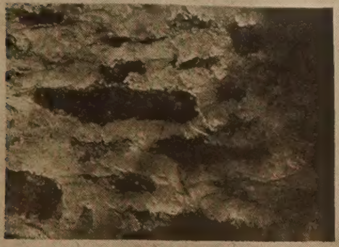


Fig 1.
Rough Rubble — Plastered Joints

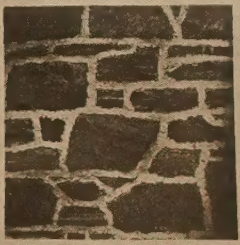


Fig 2.
Rough Rubble — large White, roughly pointed joints

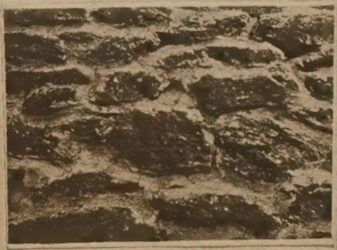


Fig 3.
Rough Rubble — trowled joints

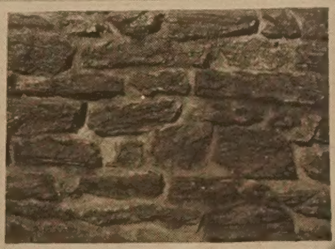


Fig 4.
Rough Rubble, or ledged work Raked joints.

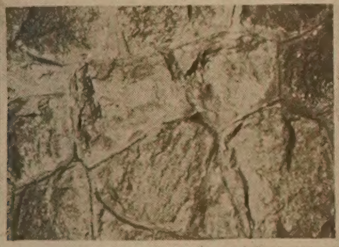


Fig 5.
Cobweb Rubble — tooled joints — no spalls

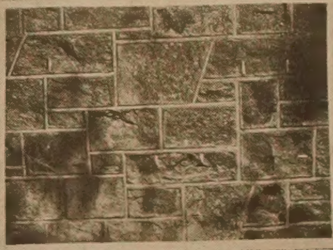


Fig 6.
Square uncoursed Rubble tooled joints

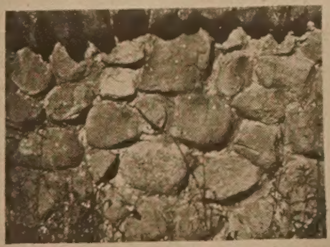


Fig 7.
Field stone Rubble raked joints

THE STONE HOUSE

The stone house is very adaptable to all those regions where this material can be secured from the excavation of the cellar or from some neighboring road improvement. Sometimes an old stone wall serves as a source of supply. Because of the native character of this material it will always be in harmony with the landscape.

In building the wall of stone there are a number of things to be observed, where success is desired. The wall should be well bonded together, the lintels over the windows should be strong, the foundations should be adequate to prevent cracks, the method of laying should be artistic, and the form of jointing in harmony with it.

All native stones used for rubble wall construction have certain characteristics of color and formation. Certain stones will split easily into long, flat shapes, others seem to have very little lamination and break into jagged, irregular patterns, while others are so soft that they lend themselves to easy shaping in squared blocks of regular size. Sometimes, even, the neighborhood may be filled with round field stones, which can be used to imbed into the face of the wall and produce a surface of round bumps. Whatever is the character of the native stone it should be used in its simplest form and not forced into imitation of some other type. The soft brown sandstones which are seen in some Colonial houses are easily cut and squared; but to cut up a hard stone into such carefully shaped blocks, in imitation of this Colonial work, would not only be a waste of money but a waste of artistic effect.

Method of Laying.—According to the way in which the stone naturally lends itself we have various types of rubble walls. The commonest is the rough rubble wall in which the stones have neither regular shapes nor regular sizes, or even courses. The wall is composed of large stones and small stones (the latter are called spalls, and fill in the interstices between the larger stones). The joints of mortar between the stones may be plastered roughly over the surface, covering much of the face of the stones themselves, or they may be roughly but neatly pointed with white mortar, or the joints may be raked out. Where the stone has a natural tendency to cleave into long, flat shapes, the rough rubble may become more regularly coursed in appearance. All of these types are respectively illustrated in figures 1, 2, 3, and 4.

A softer stone, which can be dressed with the hammer, may be treated in two different ways: It may be shaped to fit closely, without using any spalls to fill up the interstices, and, thus, appear as a cut-out puzzle; this is called "cobweb rubble." However, the more dignified treatment is the squared, uncoursed rubble, in which the blocks are cut to rectangular shape and the joints pointed with a tool. Figures 5 and 6 illustrate these.

A wall built entirely of field stone depends upon the mortar for its strength. It appears the best when the joints of the surface are raked out, permitting a large part of the stones to project outward. Figure 7 illustrates this kind of rubble wall.

When the rubble wall is built with very carefully squared stones, and in regular courses, it partakes more of the monumental character of ashlar work and draws away from the rustic value of rubble. In determining the amount of cutting which is to be done, the character of the building should be considered, remembering that the smoother and more finished the wall, the more monumental is its appearance.

Mortar, Bond, and Thickness.—The kind of mortar which should be used for the rubble wall depends upon its location and desired appearance. All foundation walls, and all walls which are subject to dampness, should be built with Portland cement mortar. Lime mortar may be used in walls above grade, although cement mortar, or cement-lime mortar is superior. As the strength of a rubble wall depends more upon the mortar than the bond, it is well to use the best. However, care should be taken that the wall is well bonded. A wall which consists of two faces, not bonded together, should not be built. A bond stone which carries through from one face to the other should be set into the wall every 2 feet in height, and every 3 feet in length. This bond stone should be flat and about 12 inches in width and 8 inches thick. The usual thickness of walls for dwellings not over three stories in height is 16 inches, and the foundation walls are made 8 inches thicker than the wall above, or 2 feet.

The footings under a stone wall should be of concrete, not less than 12 inches thick, and should rest upon solid ground at a depth equal to, or greater than, the frost line below the surface, unless solid rock occurs above this point. The width of the footings should be such that it projects outward on both sides of the wall at least 4½ inches.

Furring.—The interior of all stone walls, and in fact all masonry walls, will show condensation of moisture over the interior surface, and if they are plastered directly on the interior the decorations will be ruined by the collection of so much water. The cause of this condensation is the same as that which forms sweat on the exterior surface of a glass of cold water. In order to eliminate this disagreeable feature, all masonry walls are furred on the interior before the lath and plaster is applied. The furring makes an air space between the wall and the plaster, and all dampness is prevented from penetrating to the interior surface of the plaster. To further increase the damp-proof qualities of a masonry wall they are sometimes built hollow, as, for example, the hollow brick wall, or the hollow terra-cotta tile wall. This air space also serves as an insulator for heat, preventing the escape of heat from the interior of the building in winter and the penetration of it into the structure in the summer.

The commonest type of furring is the 1-inch by 2-inch wooden strip, nailed to the joints of the masonry or to wall plugs inserted in the joints. Metal furring strips are also extensively used, and occasionally hollow terra-cotta furring blocks.

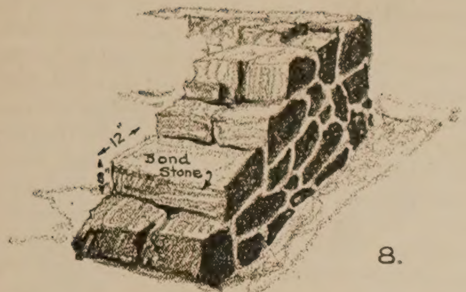
Brick House

Like the stone house, the brick dwelling is one of the oldest types in this country. Many of them were, in Colonial days, constructed of brick imported from Europe in the holds of ships, returning empty of cargo and in need of a ballast. Examples of early brick houses show a taste for good brick, which later died out on account of the introduction of the first American machine-made bricks. These early machine-made bricks were extremely ugly, due to their perfection of geometric shape, smoothness of surface, and monotony of red color. Later improvements in the manufacture of brick have released this material for extensive artistic use. The surface was given a varied color and texture, and the form was not made so machine-like. To-day we have a variety of bricks which range in colors through reds, yellows, buffs, greens, blues, and even dark violets. Textures of wire-cut bricks are rich and varied, and, if properly handled, can produce the very finest architecture.

Bonding and Construction.—The thickness of brick walls for dwellings, not higher than three stories, should be 12 inches, although some cheaper types are constructed with the upper story 8 inches thick. If the foundation walls are of rubble stone they should be 8 inches thicker, and if of brick or concrete they should be 4 inches thicker. Usually the walls will be faced with some variety of face brick, in which case they should be bonded into the wall. If a running bond is used, the face brick should be bonded into the backing at every sixth course by cutting the corners of each brick in that course of face brick and putting in a row of diagonal headers behind them, and also using suitable metal anchors in bonding courses at intervals not exceeding 3 feet. Where Flemish bond is used, the headers of every third course should be a full brick and bonded into the backing. If the face brick is of different thickness to that of the common brick backing, the courses of the exterior and interior should be brought to a level bed at intervals of about eight courses in height of face brick, and the face tied into the backing by a full header course or other suitable method.

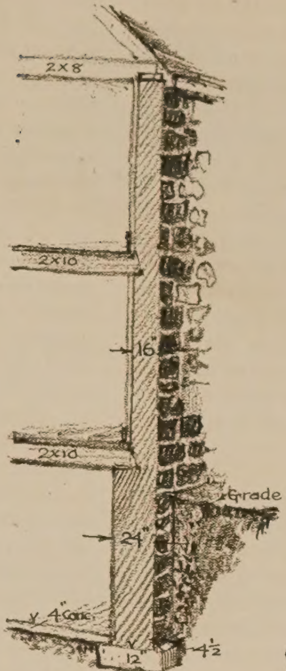
Fundamental Bonds in Brickwork.—It is very easy to understand the bonds in brickwork if the fundamental forms are known. There are, in reality, but two real bonds; namely, the English and the Flemish bond. The so-called running bond is no bond at all; while the common bond is found only in common brick walls, and uses a bonding course of headers every sixth course. The Dutch bond is only a slightly altered arrangement of the English bond, and is produced by merely shifting the centring of vertical joints of the stretcher course. By arranging these fundamental bonds in varying manners a decorative pattern can be produced on the wall of brick.

Types of Joints.—Here, again, as in the stone wall, the mortar joint plays a great part in the final effect of the



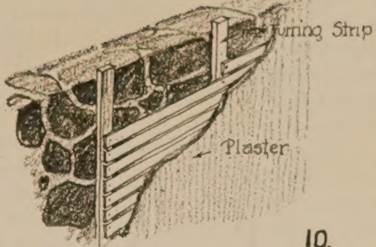
8.

Bond stone every 2' in ht. and 3' in length



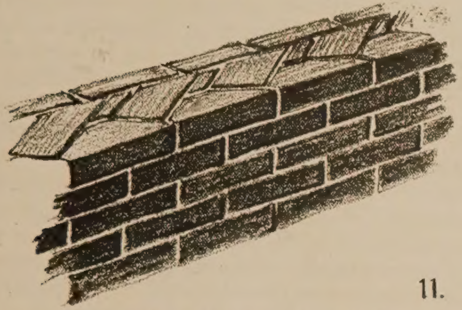
9.

Thickness of rubble stone wall



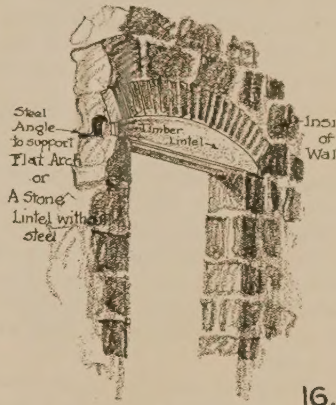
10.

Wood furring Strips



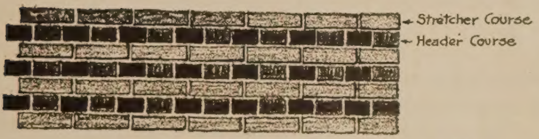
11.

Running Bond and method of Bonding


Steel Angle to support Flat Arch or A Stone Lintel without steel
Timber Lintel
Inside of Wall

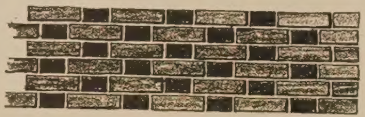
16.

Lintel Construction



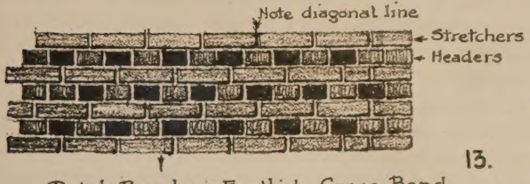
English Bond

12.



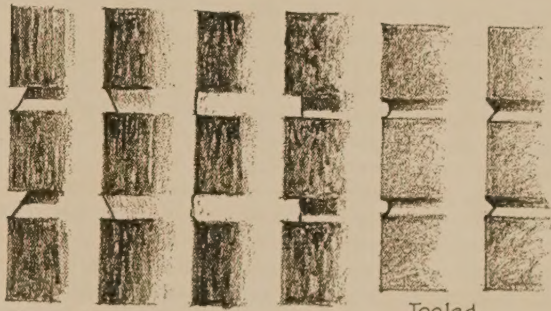
Flemish Bond

14.



13.

Dutch Bond or English Cross Bond



Trowel Struck

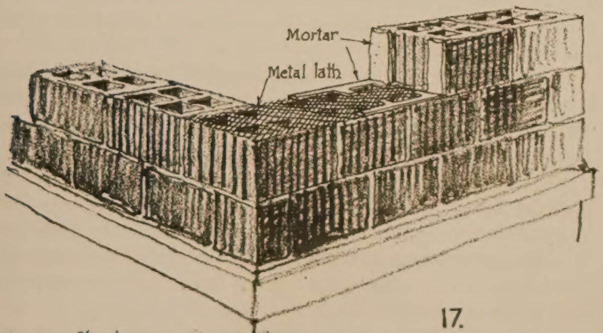
Flush-cut

Raked

Tooled

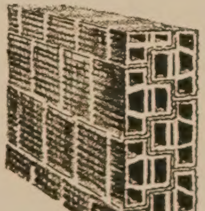
Brick Joints

15.



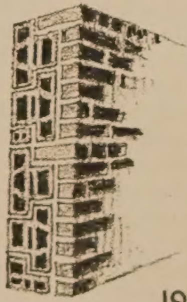
17.

Vertical cell Hollow tile wall



18.

12" Hollow tile wall
Cells Horizontal



19.

Brick Veneered
Hollow tile wall

design. It can be safely set forth as a rule that the rougher the texture of the brick used, the rougher and wider should be the joint. For the smooth-faced brick the joint should be small and finished with a tool. For a rough-faced brick the joint should be large and rough in texture. The various forms of brick joints in common use are shown in the illustrations.

Lintel Construction.—In the construction of lintels in either the wall of brick or stone, the introduction of either wood or steel is necessary for strength. Where the openings are less than 4 feet in width, timber lintels are used at the back of the lintel or arch, which are cut to serve as a centre for a rowlock or keyed arch. Any face brick may be supported by using a small angle. Where lintels are wider than 4 feet, steel I-beams, channels, or angles must be used. Where the span is more than 6 feet, it is necessary to build in bearing plates for the support of the ends of lintels.

Hollow-Tile House

The past decade has seen an increasing use of hollow terra-cotta tile as a building material for the walls of the small house. It has many advantages which have made its popularity increase, such as its larger and lighter construction unit, reducing the labor of setting, its cellular wall features, and its availability. There is much information published by the manufacturers describing the correct construction, but always, of course, with an eye to advertising the material.

However, there has been much conflicting testimony made concerning the practicability of hollow-tile construction, and some of the disadvantages should be noted. As a rule, they have proved to be strong enough to support the weight of the structure imposed upon them, but in the Southwest, where tornado winds are prevalent, these walls have been criticised because of their lack of stability and their porosity. Hollow-tile walls have been thrown down while those constructed of brick have stood, and driving rainstorms frequently make the inside of the walls wet.

The stability can be increased by filling them with concrete, but the allowable strength cannot be considered to have been raised. Tests have shown that this filling does not increase the strength, because of the difference in the elasticity of the two materials.

Types and Construction.—There are two types of hollow terra-cotta blocks: one which builds with cells vertically and the other which builds with cells horizontally. This latter is generally an interlocking tile. The strongest wall for vertical-load resistance is built with vertical-cell tiles.

All hollow tile should be laid in Portland cement mortar, and the webs should be arranged so that they build over one another. The bearing of floor beams and girders on walls, built with blocks of vertical cells, should be made by covering the tile with templates of terra-cotta slabs, filling them with concrete or protecting them with plates of steel. Where chases are required for pipes they should not be cut into the wall, but special blocks should be used to build around them. All lintels under 5 feet should be constructed with tile arches, reinforced with concrete and steel rods inside of their webs.

Precautions against Dampness.—In order to prevent the penetration of moisture the mason should butter all joints on the inside and outside edges, leaving an empty space between, in order to insulate against the transmission of moisture through the joint. To prevent the collection of mortar in the cells of the tile, due to droppings during construction, the spreading of metal lath over the top of each course of tile will accomplish this and also make the strength of the wall greater. Although it is often recommended that hollow tile be plastered directly upon the interior, yet this is not safe in those sections of the country where there are driving rain-storms. For this reason it is advisable to fur them on the interior. It is also recommended that a waterproofing compound be added to the stucco applied to the exterior. Another fact should be observed; namely, that all door and window frames, since they are of wood, will tend to shrink and thus open up the joints and permit the leakage of rain-water. Oakum should be stuffed behind all brick moulds to prevent this. Care should also be taken to make drips under all sills, so that no water will leak into the interior of the wall. All belt courses should also have steep washes. Stucco should not be carried down to the grade level, but a course of solid material, like brick, concrete, or stone, should be built at this point.

Veneering.—It is sometimes customary to veneer walls of hollow tile with brick, especially those tiles which are of the interlocking type, since a better bond can be secured. In any case, any brick veneer should be bonded to the backing with a row of headers every 16 inches, or be attached with metal ties. This veneering should not be considered as part of the required thickness of wall.

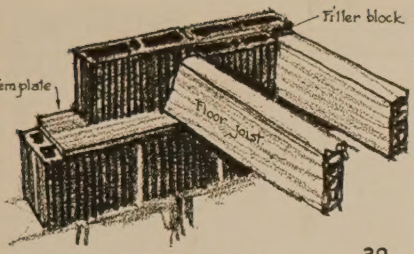
Wall Thickness.—The thickness of hollow-tile walls should be the same as for walls of brick. The construction of light 10-inch and 8-inch walls, while strong enough as a substitute for a frame dwelling, is not strong against weather or fire. The only justification for thin walls is the slightly reduced cost of materials. Hollow blocks, as a rule, are not used for foundations, although they are satisfactory under buildings not higher than 40 feet. It is better to fill such walls with concrete and waterproof them on the exterior.

Concrete House

The development of the concrete house has been stimulated by large corporations erecting towns of them in one locality. The erection of concrete houses by individual builders cannot, as a rule, follow those systems which are adapted to group construction. The use of large precast units may be satisfactory for a development of a hundred or more houses, but it is not economical for a single operation. The use of heavy steel forms for casting monolithic houses of concrete, while under certain favorable labor conditions may be satisfactory for a small job, yet as a rule is better adapted to large enterprises. Such steel forms are represented by the Lambie forms and the Hydraulic forms. Even wood forms of heavy construction, like those used in the Ingersoll system in work at Union and Phillippsburg, are not adapted to an operation involving less than fifty identical houses. Another system, combining both the precast and the cast-in-place work, called the Simpsoncraft system, is not economical for small operations. This uses thin precast slabs for walls and floors, and precast concrete beams. The precast parts are tied together by casting in place reinforced studs of concrete.

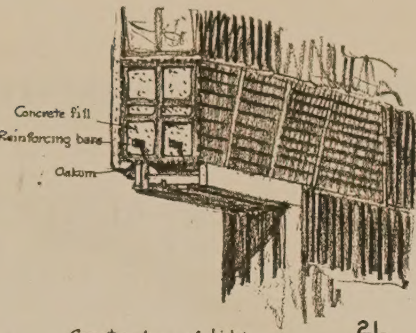
Practically the only available systems which are useful for the small operation are (1) monolithic houses, built with light, portable steel forms or wooden forms, and (2) the concrete-block house.

Block House.—The concrete house, especially that built of blocks, often has the defect of being damp on the interior, unless precautions have been taken to avoid this. It is always best to fur the interior of walls, although there have been cases where the blocks have been waterproofed and the interiors remained dry. Usually those blocks which are cast in a very dry state are porous, while those which are poured show considerable compactness. The great diffi-



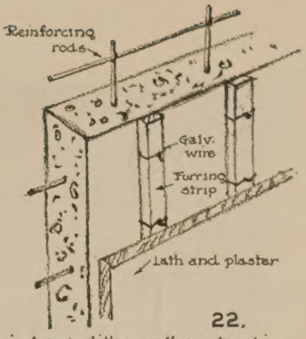
20.

Support of floor joists



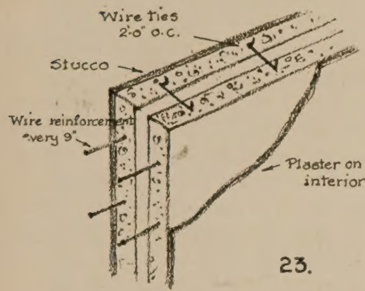
21.

Construction of lintel



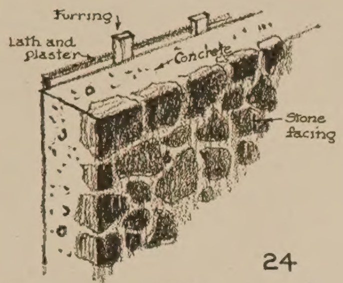
22.

Typical monolithic wall construction



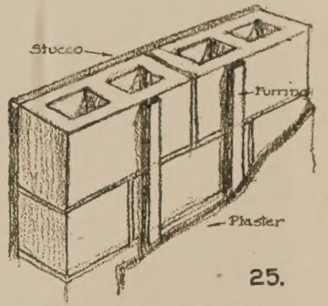
23.

A double monolithic wall built by the Van Guilder machine.



24

Stone faced concrete wall developed by Ernest Flagg



25.

Typical Concrete block wall.

culty in using concrete blocks lies in the inexperienced and inartistic work of the large number of "would-be manufacturers," whose only claim to the product consists of having purchased a machine which will turn out so many blocks a day and reap them an advertised fortune in a short period. A thoroughly reliable concrete block can be made if there is used plenty of good cement, clean aggregate with proper proportions of fine and coarse to secure density, sufficient water to make a wet mixture, and then the product kept damp while curing. The surface should also be finished in some artistic manner. A good method consists in applying about an inch of white cement and showy aggregate to the outer facing of the block, and then, when the block has been set into the wall, finish it off with a stone-tooling machine, such as a pointer, operated by a pneumatic hammer. Blocks, also, should be of the hollow-wall type, so that an air space between can be secured for ventilation and insulation.

Monolithic House.—The commonest method of building monolithic walls of concrete is to use wooden forms. These are built in sets of panels, one for the exterior and the other for the interior face of each course. These are successively raised, one above the other, in pouring the walls. Mr. Ernest Flagg, architect, has developed a remarkably simple system of concrete-wall construction with the wooden form. Roughly broken stone are set against the inside of the forms, used for the exterior face of the wall, and the rest of the wall is filled up with concrete. By raising the boards which are used for the forms, as each layer hardens, the wall can be erected without skilled labor and yet have the appearance, on the exterior, of a stone wall. Of course it is necessary to point the joints of the stone-work after the forms have been removed.

Of the light steel forms, the most important on the market are the Metaforms and the Morrill forms. The Metaforms, originally the Reichert forms, are composed of individual form units. All units are standardized and interchangeable, and equipped with the necessary clamps and locking devices. These units are built of sheet steel, strongly reinforced, and measure 2 feet square. A single course of Metaforms is composed of an inner and outer shell of plates. As the work progresses the bottom course is taken off and placed above for the next, there being usually three courses of forms in operation. The Morrill form is also a sheet-steel form, only it uses a hinged "swing-up" construction, by which the lower courses of the form can be swung up into position for the new course as the work progresses.

The Van Guilder double-wall machines have been gradually increasing in use throughout the country. They are not for sale, but the company establishes a contracting organization in different centres. The machine is a steel mould which is moved along and upward as the concrete wall is tamped in it. It builds a double wall in tiers. Each tier is 9 inches high and 5 feet long. A complete circuit of one tier is made around the wall, and then the next tier is begun on top.

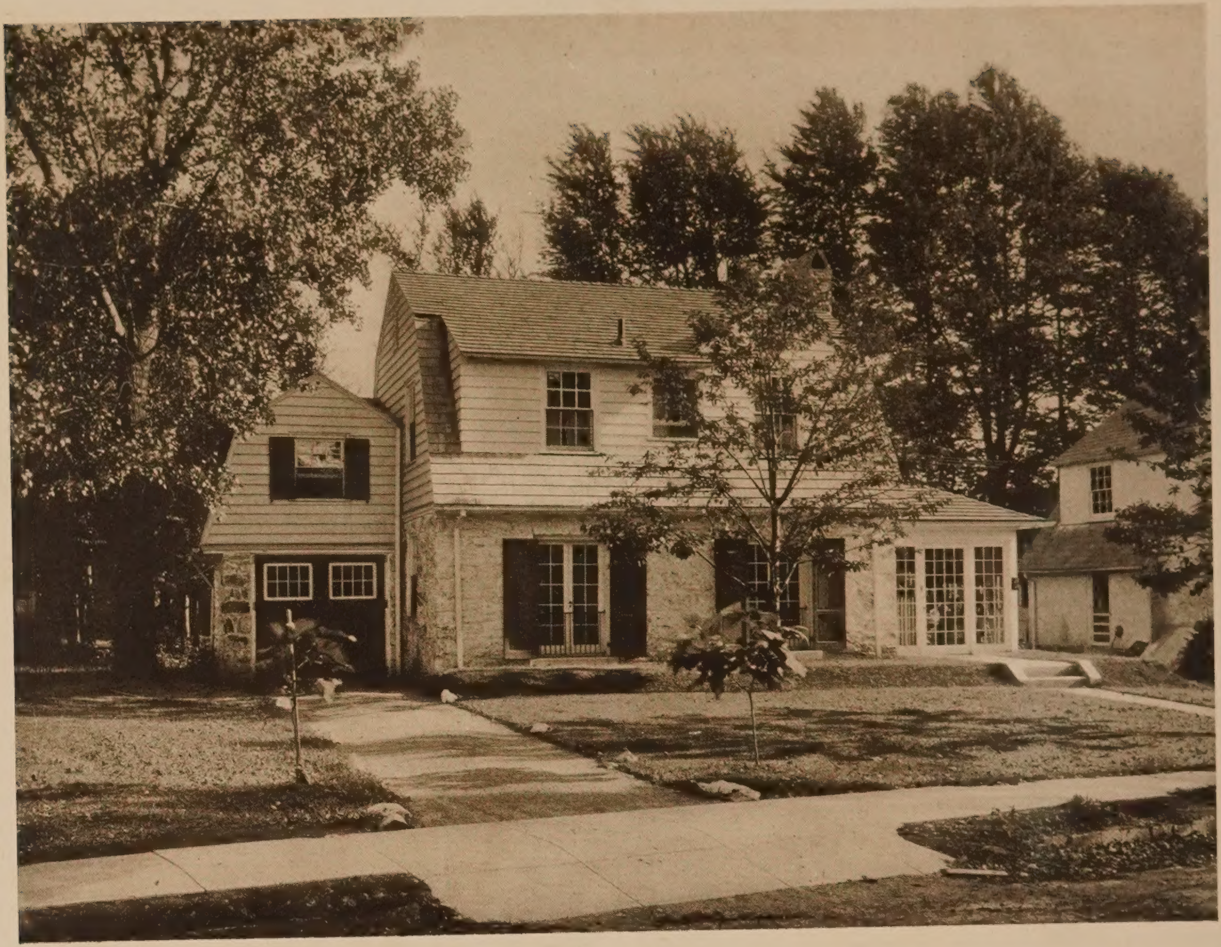
End.

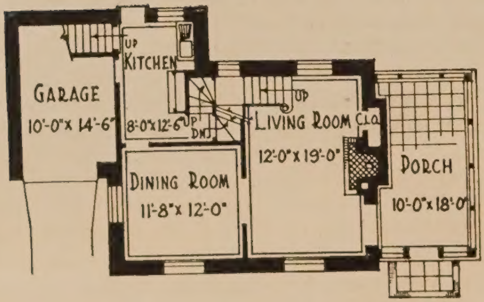
A Correction

Mr. Walsh has asked us to call our readers' attention to an error in his article in the December number. The paragraph reading:

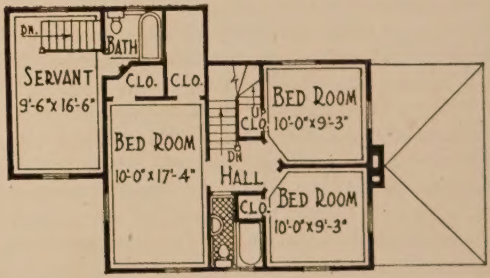
"It comes in two grades, IX and IC, the former being No. 27 gauge and the latter No. 29 gauge. The heavier is used for roofing and the lighter for valleys and gutters" on page 367, under the paragraph on Metals, should have been:

"It comes in two grades, IX and IC, the former being No. 28 gauge and the latter No. 30 gauge. The lighter is used for roofing and the heavier for valleys and gutters."





First Floor Plan



Second Floor Plan

HOUSE, MRS. HARRIET A. PIERSON, NARBERTH, PA.

Wallace & Warner, Architects.

Editorial and Other Comment

The High Cost of Waiting

WE are indebted to Mr. Davidson and his interesting "Bulletin of the Illinois Society of Architects" for some significant and instructive statistics, and they seem of so much value that we are going to pass them on to our readers, who may not have seen them.

The whole problem of building to-day is one that relates itself to the matter of high costs, and the attitude of the client in this case has been and is that of many all over the country.

An argument to the effect that you might as well build now, that there can be no possible return to pre-war prices, can be supported, and the further argument that the present high rentals warrant going ahead, may furnish an added incentive to immediate progress. We have had five or six years of mounting costs, and of late some more or less encouraging surface indications that times may be a little better. We have noted a number of times that there seems no lack of capital for large enterprises, and that big hotels, warehouses, factories, theatres, office-buildings are going up all over the country.

The one greatest need—small houses, places for people of moderate means to live—seems the difficult thing to meet. Ways and means have been and are being discussed, and the investigators are trying to devise some way to compel insurance companies and banks to use their funds for this purpose. Mr. Davidson's building was a warehouse, and, as he says, the owner preferred waiting for better conditions —with the results shown in the figures given below. They were the result of actual competitive bids:

	Aug. 29, 1917	June 18, 1918	June 18, 1919	Sept. 15, 1919	Feb. 3, 1920	Nov. 9, 1920
Masonry, carpentry, and concrete	$98,783	$119,283	$136,700	$155,532	$213,000	$207,000
Structural steel and misc. iron	13,468	15,400	16,300	16,300	21,535	19,665
Cut stone	1,195	1,965	2,438	2,792	3,748	4,970
Sheet metal	240	282	360	360	475	807
Hollow-metal stair doors	2,100	2,135	2,121	2,121	2,522	3,450
Elevator doors	2,400	2,450	2,580	2,880	3,700	4,570
Fire-escapes	2,428	2,428	2,381	2,518	2,923	2,923
Plastering	525	550	570	665	833	1,000
Glazing	1,820	1,645	1,526	1,681	2,524	2,919
Roofing	1,192	1,240	1,380	1,640	2,000	2,580
Vault doors	185	220	250	260	265	290
Painting	2,593	3,140	3,412	3,712	4,327	5,200
Plumbing	5,355	5,782	6,054	6,654	8,538	10,040
Elevators	4,740	4,800	4,900	5,100	6,450	6,700
Heating	4,000	4,300	4,500	4,800	6,500	8,000
Electric wiring	2,000	2,000	2,000	2,400	3,000	3,400
Sprinklers	17,500	17,500	18,000	18,900	23,187	23,187
Hardware	500	520	560	575	800	875
Total	$161,024	$185,640	$206,032	$228,890	$308,327	$307,576
Cost per sq. ft	1.46	1.68	1.87	2.07	2.80	2.79
Cost per cu. ft	.097	.114	.124	.132	.187	.186
Percentage of increase over 1917		15%	28%	41%	92%	91%

A Plan for Cheap Houses

FROM the Borough of Richmond on Staten Island, one of New York's big suburbs across the bay, comes the encouraging news, in a booklet prepared by the borough's president, Calvin D. Van Name, of a businesslike plan to relieve the housing shortage. The plan is based on facts compiled by the chief clerk of the Bureau of Buildings:

"In the Borough of Richmond (Staten Island) we can erect a six-room, 1½-story detached cottage on a lot 25 by 100 feet, with all conveniences, near station, for $3,000. A large number of these homes could be built in sixty days. No initial payment would be required and the tenant could reduce his rent each year."

In a communication to the Board of Estimate last April, Mr. Van Name asked a $2,000,000 issue of corporate stock. He said:

"I am prepared to say that if this money is expended in Staten Island the borough government, as its direct contribution to the cause, will undertake without any additional help or expense to supervise, through its Bureau of Buildings, the erection of these homes."

"Another type of home suggested is a five-room, two-story building, complete in every particular, on a lot 25 by 100 feet. Such a home, including the lot, is offered for $4,000.

"In recent times large industrial corporations have built homes for employees. During the war the government did the same. There is no reason why a municipal corporation cannot erect homes as outlined above."

This seems to us full of promise. After all, much of the delay has been due to a lack of real getting together. When old ways have gone, new ways must be devised. We are prepared to say that the architects may be trusted to show the way to build with a thought for economy, and find practical ways for saving by new methods of construction and simplified use of standardized materials. We have had to learn a mighty hard lesson, but maybe it will have a wholesome tendency if the general result is to convince the home-builder that good taste is best evidenced in a certain dignified restraint.

The dominant architecture of many of our suburbs—we call it architecture by courtesy—has been in the past largely the result of the desire to make a five-thousand-dollar house look like the one near by that cost ten, and by co-operation between the the real-estate boomer and the builder and contractor.

The architects showed us how much charm could be expressed in the work done in some of the war industrial developments. Our country houses are designed too often to be something different, the something many times not born in the mind of an architect, but in that of a client who has been looking at the newest thing in bungalows shown in some publication devoted to the spread of real culture in every-day things.

The old carpenters and builders of New England, and all who inherited something of the Colonial tradition, followed certain accepted formulas, and the old houses that survive are still an inspiration.

We all think of old New England houses and old New England doorways as things usually worth while.

Their builders were content with following, with slight variations, the good work that had been done. We see in our towns the influence of all the styles that ever existed, and some that could be only the inventions of a lunatic asylum or a pseudo-something-or-other. No mere architect could tell from what they are derived.

The "Own Your Own Home Expositions" can do no greater service to the community than to convince the public that every home is likely to be a better home because it has had the benefit of the services of a trained architect.

The Small House Competition

THE architectural profession has enthusiastically entered into the spirit of the "Small House Competition," with the view to nationally stimulating home building and home ownership as approved by the American Institute of Architects, according to Henry K. Holsman, president of the Illinois chapter, who is acting as architectural adviser.

The prize-winning plans will be first exhibited in conjunction with the first annual "Own Your Home Exposition" in the Coliseum at Chicago, March 26 to April 2, according to Robert H. Sexton, managing director. Real-estate boards throughout the country are evincing much interest in the "Small House Competition," co-operating in connection with the "Own Your Own Home" movement as sponsored by the National Association of Real Estate Boards.

The Philadelphia Real Estate Board has asked that an exhibition of the prize-winning designs be held there. Similar requests have been received from Boston, New Haven, and the newly organized society, Art Center, Inc., New York City.

"The entire programme seems to have met with a very agreeable and very general response throughout the country," writes Mr. Holsman, who has received, among many letters, one of commendation from the president of the American Institute of Architects. At the Chicago "Own Your Own Home Exposition," a fac-simile of the first prize-winning house will be constructed of lumber, and the front elevation of the first prize-winning brick home is to be erected by exhibitors who have already been allotted space.

The Architectural League Exhibition

THE 36th Annual Exhibition of the Architectural League of New York, will be held from April 1 to April 30, inclusive, in the Metropolitan Museum of Art.

Information regarding the most efficient and economic methods for structure and equipment is vital to every architect. This exhibition is planned with a view to assembling, as completely as possible, all that is used in building.

Telephone Circle 2837, or write 215 W. 57th St., Miss A. M. Simpson, assistant secretary, for information regarding space.

Book Reviews

DESIGN AND TRADITION. A Short Account of the Principles and Historic Development of Architecture and the Applied Arts. By AMOS FENN. Universal Art Series. Charles Scribner's Sons: New York.

Now and then we come upon a book like this for which we have been looking, one that gives us in brief compass and well-considered essentials a summary of many volumes. Such books, frankly, but an introduction to a more thorough knowledge or a reminder of many things we find it hard to keep in mind for ready reference after much seeking, have a refreshing way of reviving our interest and often making clear some things that were more or less obscure, on account of the very completeness with which they were presented. There is an encouraging interest in the arts and crafts and our schools and museums are taking a more practical view of teaching, and of showing the value of a knowledge of tradition and of past achievement. Good design is not a matter of inspiration, nor is good taste something personal, a gift without cultivation. Good taste is invariably our own; bad, the selection of others, but it is irrational to assume that we all naturally possess a knowledge which indisputably takes many years to cultivate.

Mr. Fenn gives us a compact and clearly written historic review of styles in architecture and their associated crafts, from primitive times to the beginning of the eighteenth century. The essentials of Egyptian, Greek, Roman, Romanesque, Byzantine, Gothic, Renaissance and other styles are pointed out and are followed with a series of chapters dealing with such details as mouldings, architectural proportions, the use of the orders, division of surface, matters of wall spacing and decoration, conventional ornament, treatment in design, mythology and symbolism, ways and means.

The text is admirably free from technical affectations or theories. A book of this sort needs, above all, adequate and competent illustrations, and these are supplied in profusion. They are mostly in line, but these are supplemented with half-tones made directly from the objects.

It is a book that will be found of real and helpful value for every draftsman, designer, and student, and it will afford a compact, useful, and ready reference for all concerned in architecture and the kindred arts.

A HANDBOOK OF INDIAN ART—ARCHITECTURE, SCULPTURE, PAINTING. By E. B. HOWELL, formerly Principal of the Government School of Art, and Keeper of the Art Gallery, Calcutta. Author of "Ancient and Mediæval Architecture of India." 8vo. E. P. Dutton & Co., New York.

India, the land of mystery, has embodied in her buildings the symbols and aspirations of her religions, made them a part of her worship, of her honor to the dead. Her architecture is everywhere an outward expression of mystery, of the imaginings of the prophets, of the faithful. The Vedic rituals, the worship of Buddha were the inspirations of her builders. As in other civilizations, the tombs of the great or the saints were the basic forms from which many of her famous rock-cut temples grew. The great Sancha Stupa may be taken as a type, and illustrates Indian art from about the middle of the third century B. C. to the twelfth century A. D.

The tombs, the palaces, the temples are marvellously rich in their carvings and varied ornament. Kipling has made us realize best the intimate relation between the people and nature, and the poetry of India written about the wild, the knowledge of the jungle, may be seen embodied in her architecture.

The author has dwelt upon the things that express the intention of the builders, correlated the stupa, temple, monastery, palace, mosque with the life of the period.

In the chapters dealing with sculptures he explains the ideas that underlie the Buddhist and Hindu conceptions of the Deity and of divine worship.

The illustrations are profuse and represent the progression of Indian architectural monuments from the earliest forms to the incomparable and famed Tag Mahall.

A BOOK OF CEILINGS. By GEORGE RICHARDSON. London: MDCCLXXVI. 48 plates.

Richardson's famous book has been a favorite reference for years, but not easily accessible to most architects, except in the larger libraries. It embodied the best taste of its period, the eighteenth century, and reflected the ideas of design in stucco of many famous architects. Inigo Jones, Webb, Sir Christopher had given great attention to the decoration of ceilings, and the brothers Adam, with whom Richardson was associated, owed to him many of their best designs.

The plates, reproduced by photolithography, represent a great variety of design, simple and elaborate, and will be a valuable and helpful reference for any architect's library.

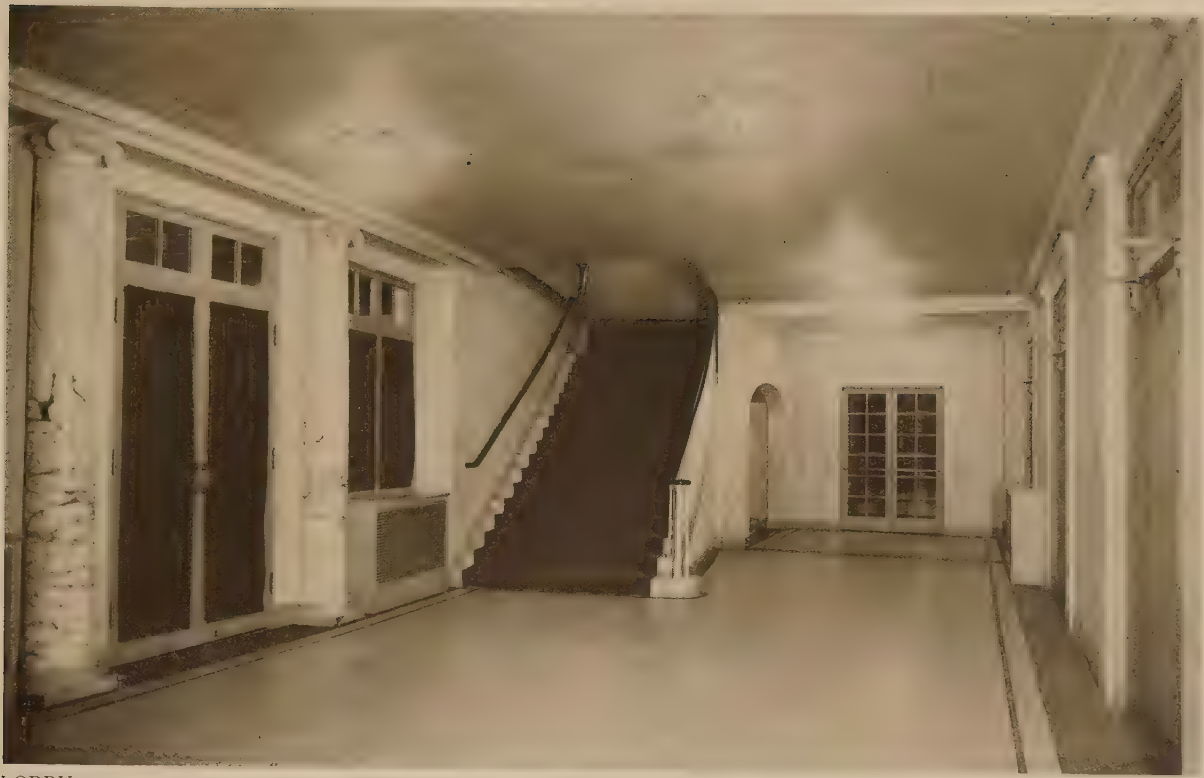
The accompanying explanatory texts have a quaint flavor of the times, quite in keeping with the classical motives of the designs:

"The subject of the middle picture is, Æneas going to Kill Helen, but is prevented by Venus." "In the pannel round the sky-light, are represented the different genii of the Polite Arts."

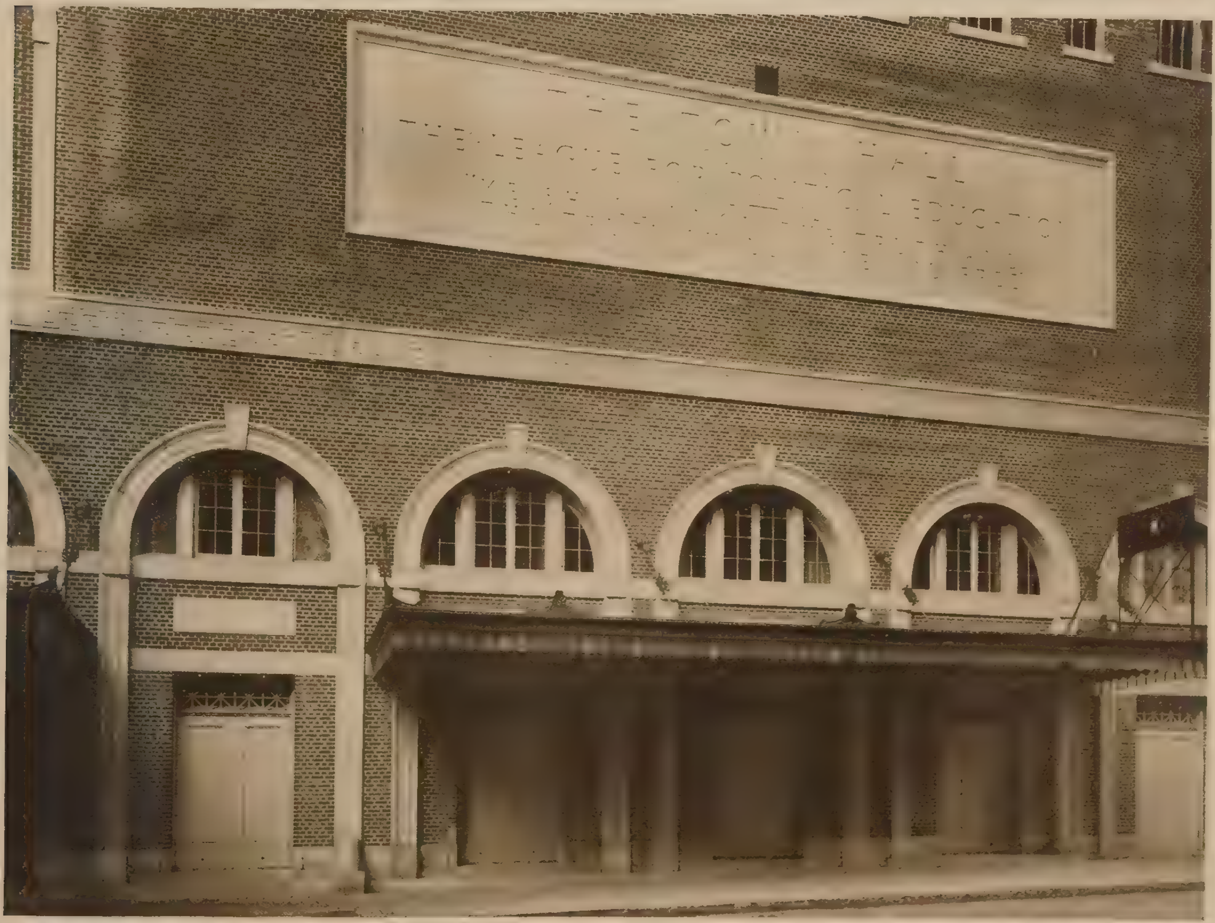
"The trophies and the other ornaments of this ceiling are executed by Messrs. Rose, with great taste."

CARPENTRY FOR BEGINNERS. By WILLIAM FARNHAM. 12mo. J. B. Lippincott Co., Philadelphia.

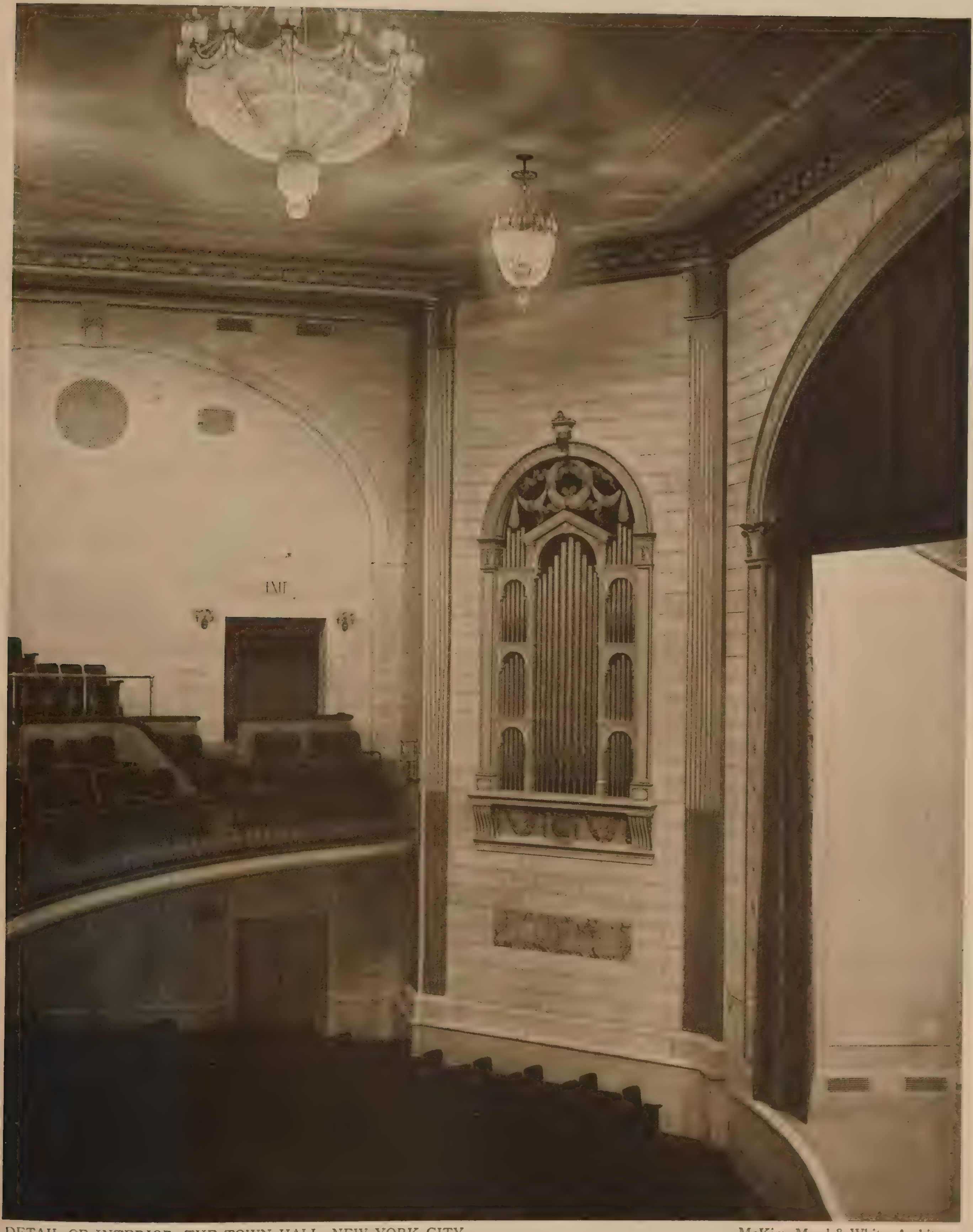
This should prove a useful little book for the handy man about the home, for it teaches the practical use of various tools and the way to put them to profitable ends in the making of all sorts of home utilities and conveniences, from a scullery mat to a fancy bookcase. It is every man his own carpenter, and many a back-yard workshop will profit by the clear description of the text and the excellent detailed drawings.



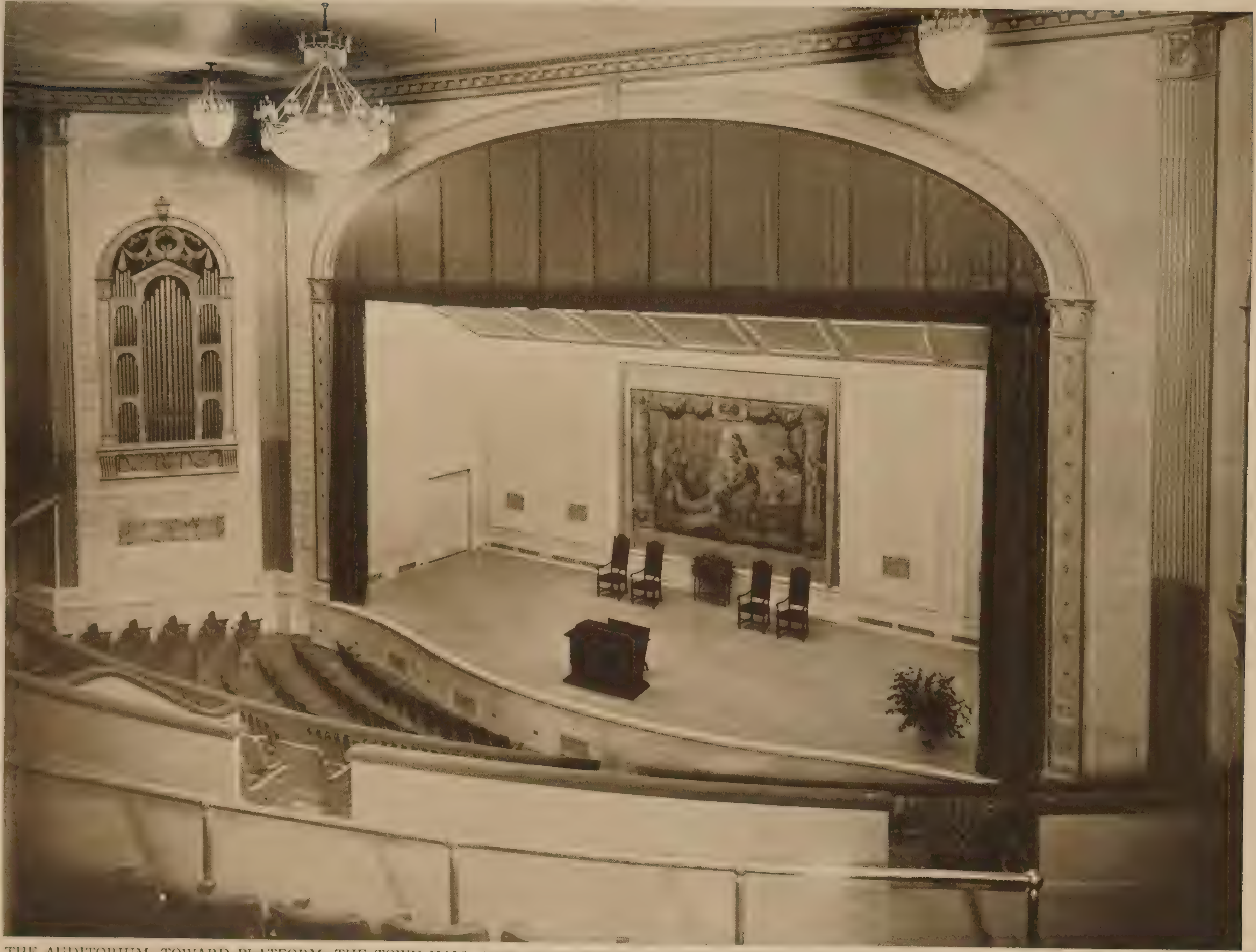
LOBBY.



ENTRANCE DETAIL, THE TOWN HALL, NEW YORK CITY. McKim, Mead & White, Architects.

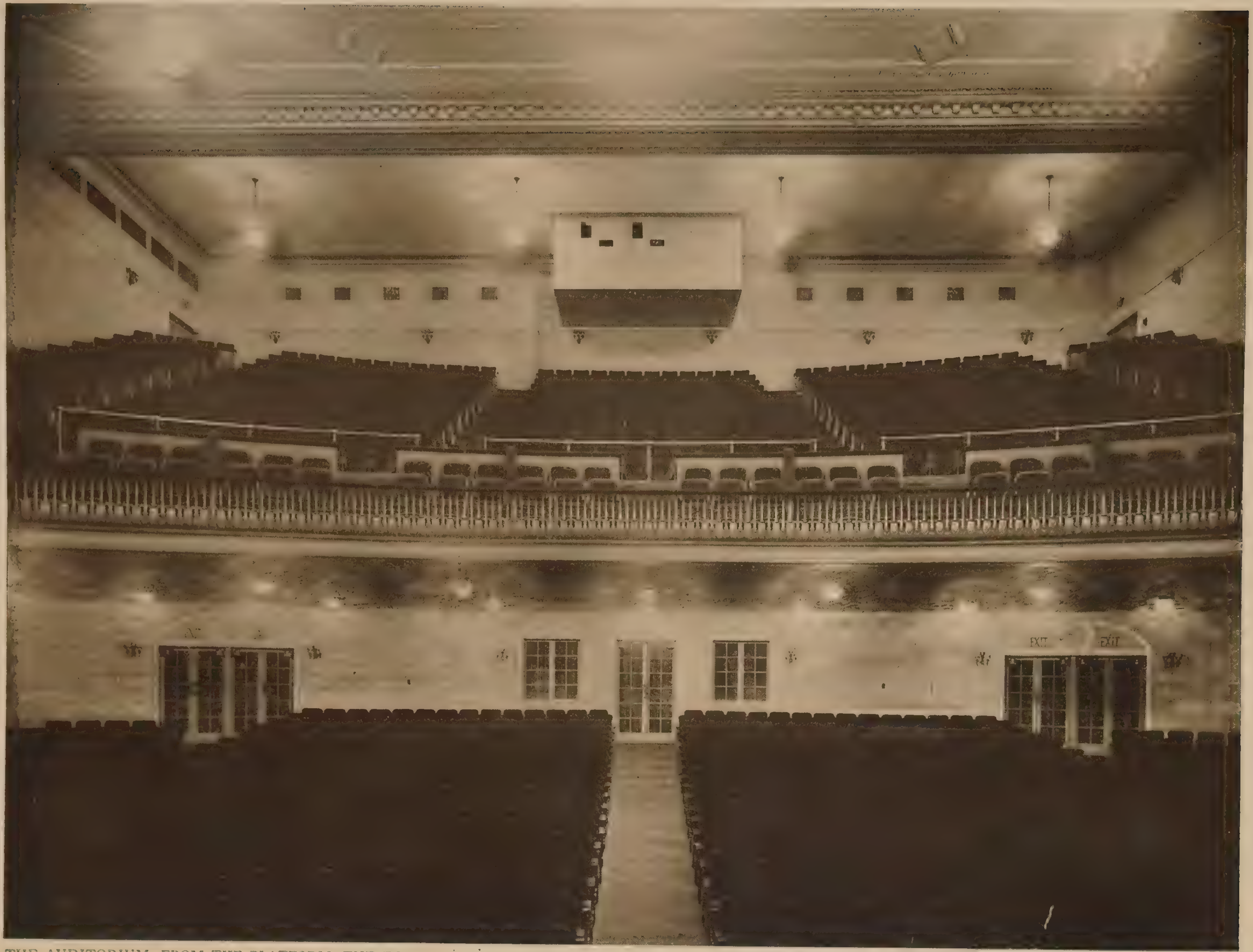


DETAIL OF INTERIOR, THE TOWN HALL, NEW YORK CITY. McKim, Mead & White, Architects.



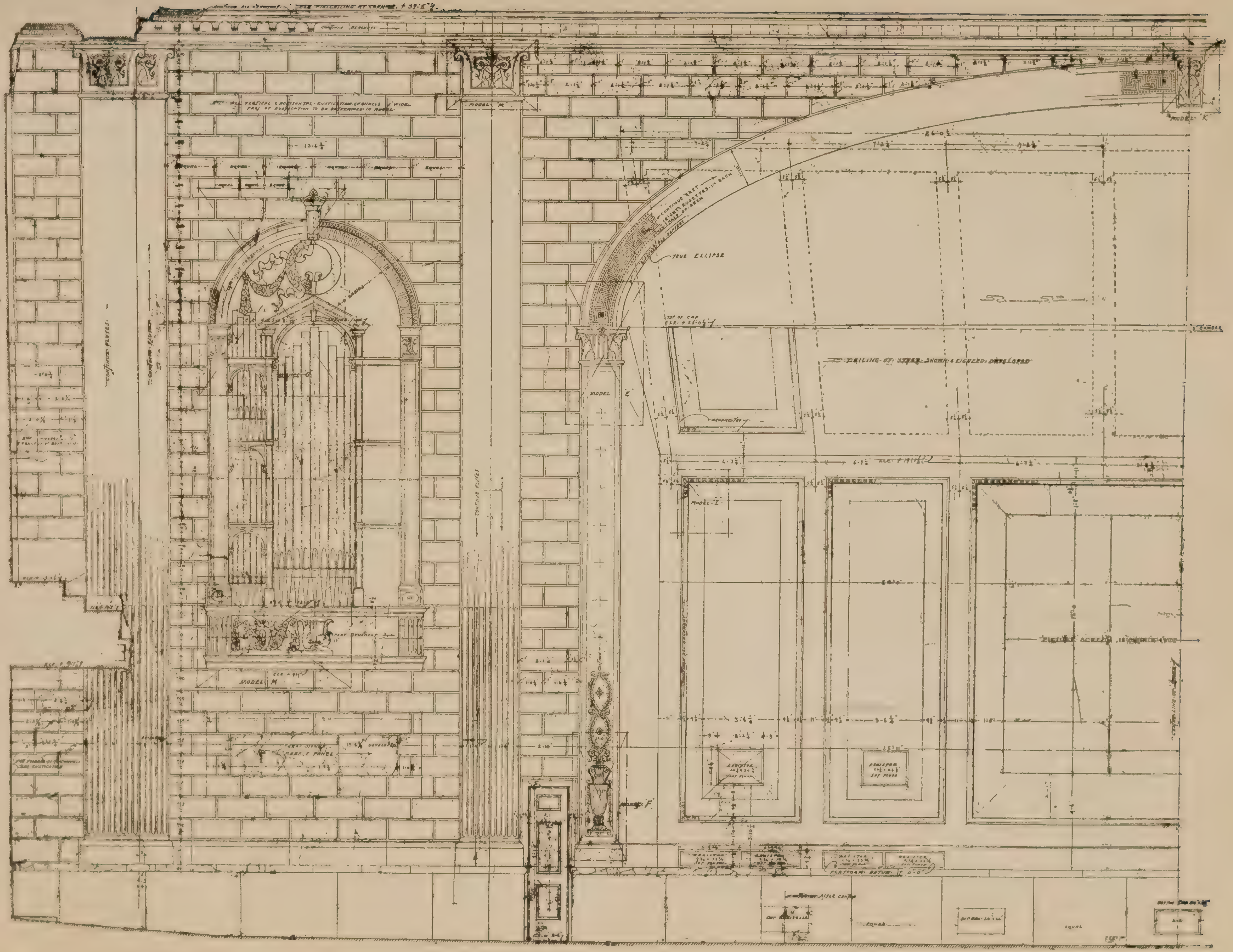
THE AUDITORIUM, TOWARD PLATFORM, THE TOWN HALL, NEW YORK CITY.

McKim, Mead & White, Architects.



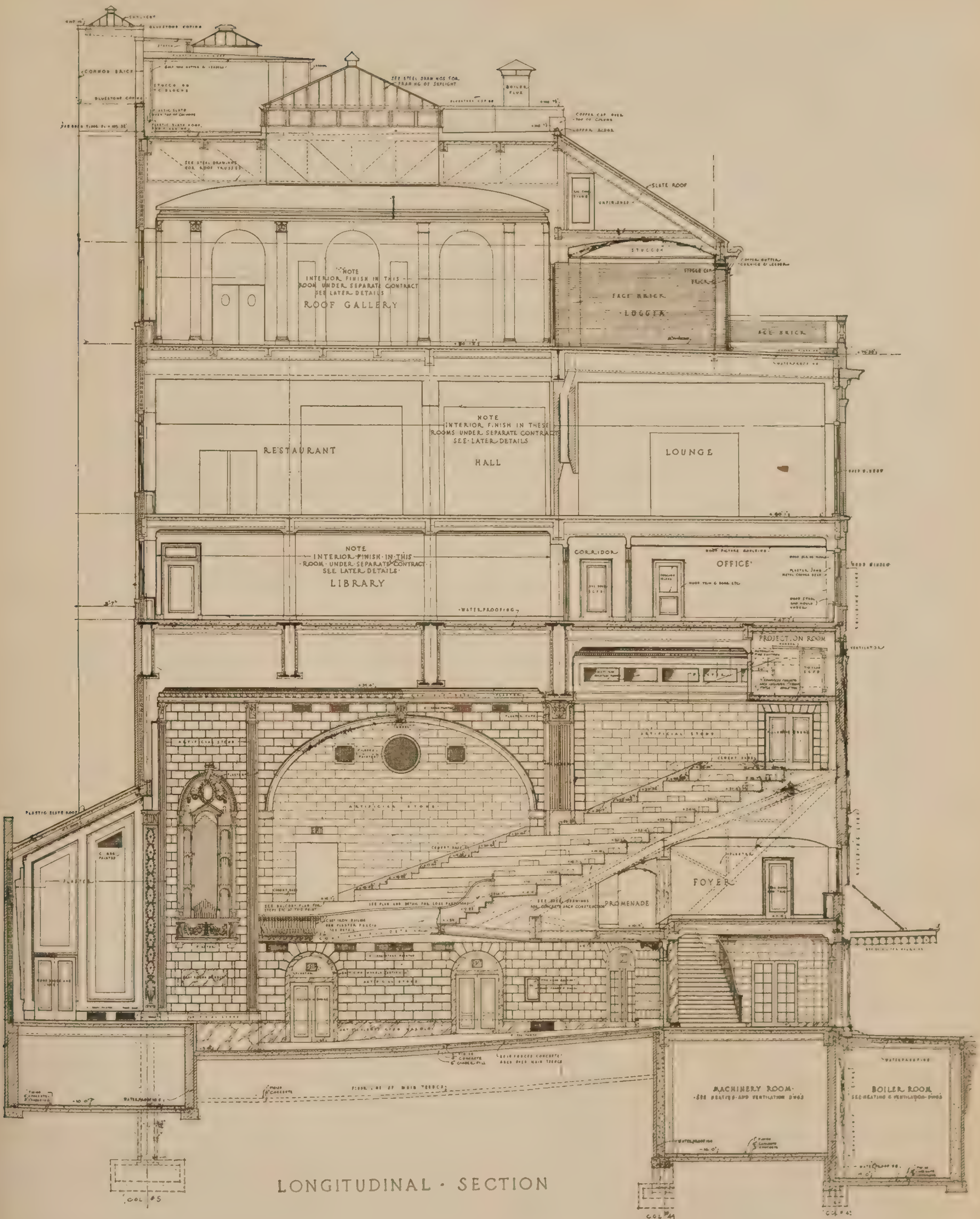
THE AUDITORIUM, FROM THE PLATFORM, THE TOWN HALL, NEW YORK CITY.

McKim, Mead & White, Architects.



DETAIL OF DECORATION, AUDITORIUM, THE TOWN HALL, NEW YORK CITY.

McKim, Mead & White, Architects.


SEE STEEL DRAWINGS FOR FRAMING OF SKYLIGHT
BOILER FLUE
SEE STEEL DRAWINGS FOR ROOF TRUSSES
SLATE ROOF
NOTE
INTERIOR FINISH IN THIS ROOM UNDER SEPARATE CONTRACT SEE LATER DETAILS
ROOF GALLERY
FACE BRICK
LOGGIA
FACE BRICK
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RESTAURANT
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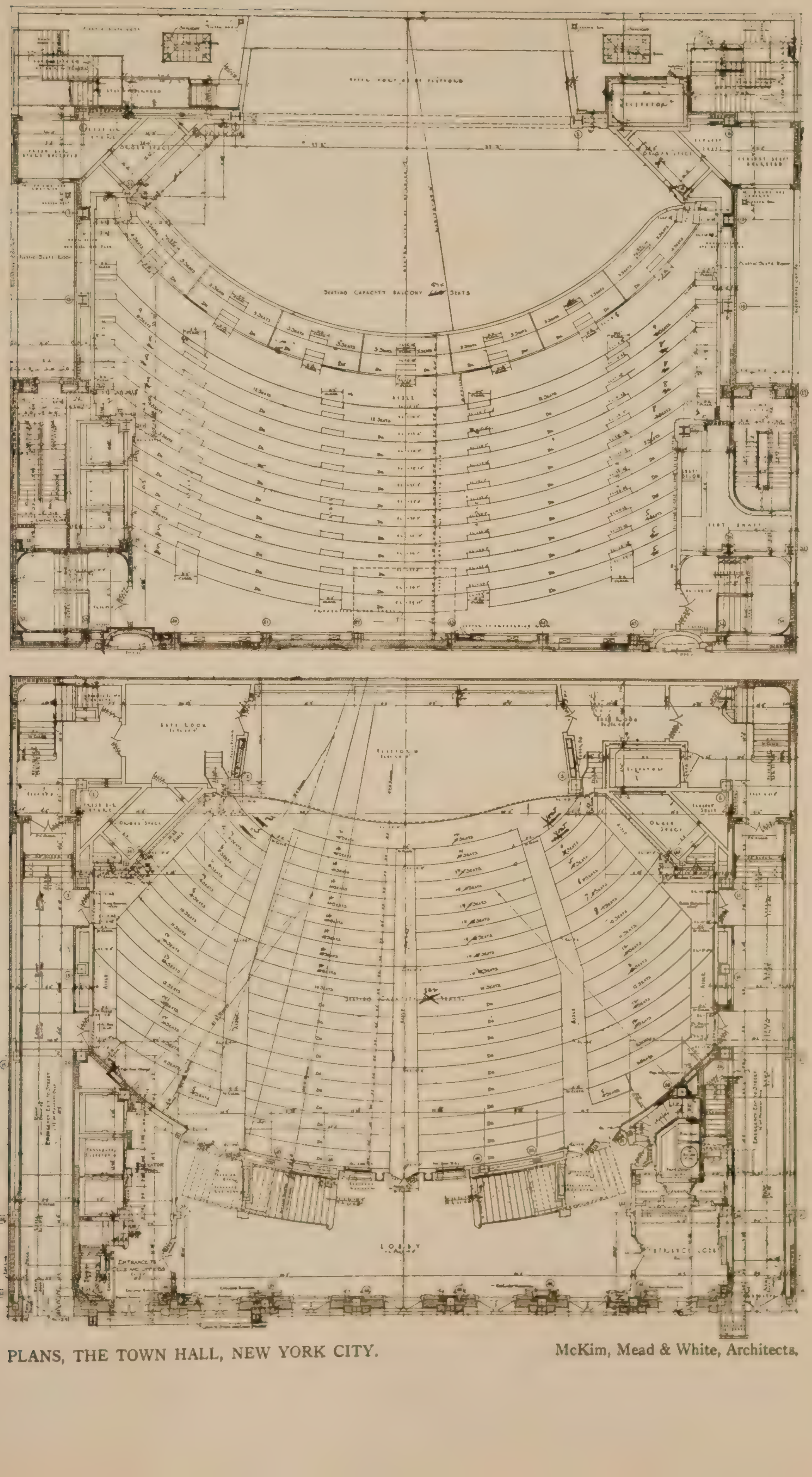
CORRIDOR
OFFICE
PROJECTION ROOM
ARTIFICIAL STONE
ARTIFICIAL STONE
PLASTIC SLATE ROOF
PLASTER
FOYER
PROMENADE
MACHINERY ROOM
SEE HEATING AND VENTILATION DWGS
BOILER ROOM
SEE HEATING & VENTILATION DWGS
WATERPROOFING
COL #5
COL #4

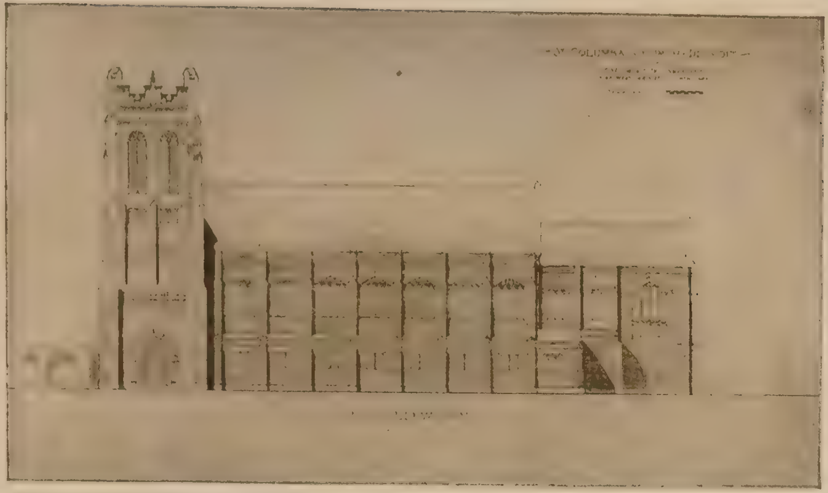
LONGITUDINAL · SECTION

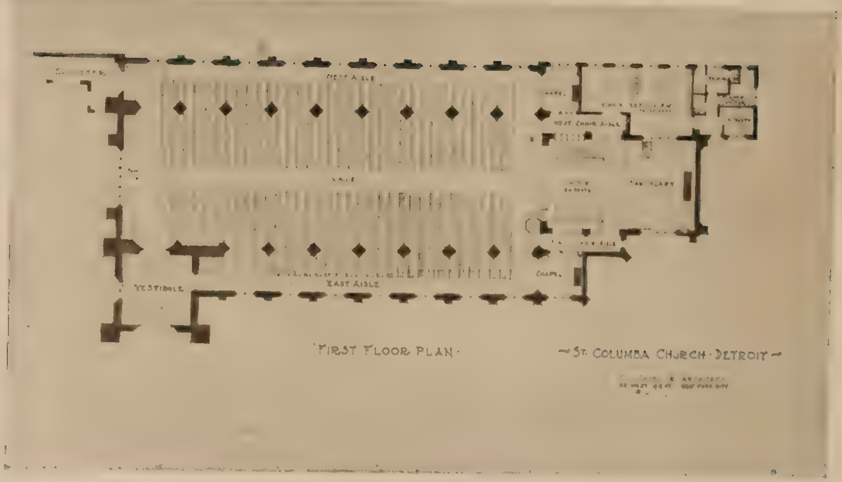
THE TOWN HALL, NEW YORK CITY.

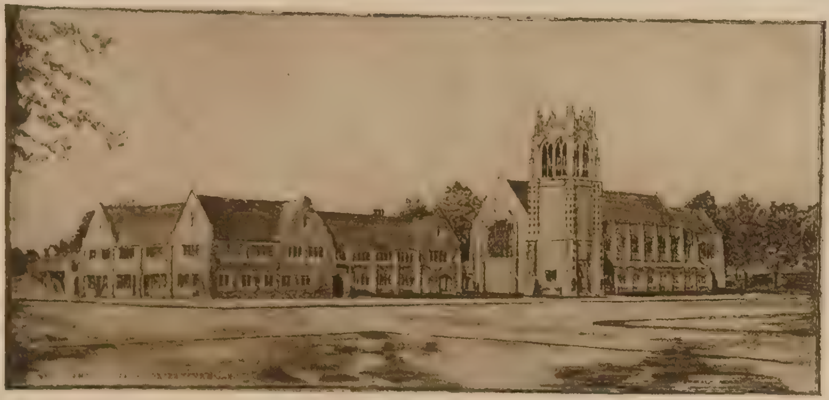
McKim, Mead & White, Architects.

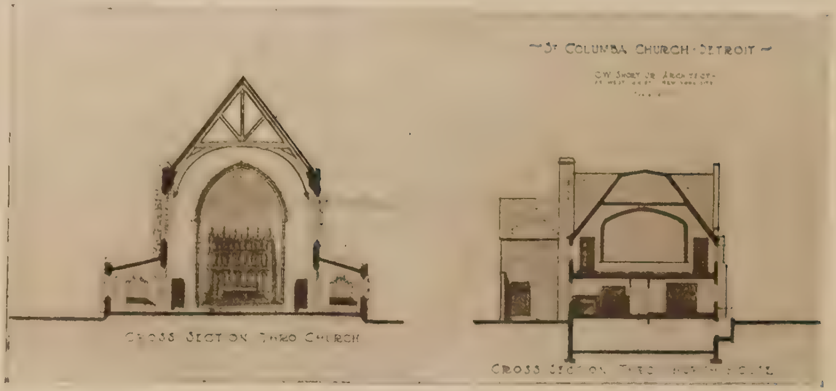


PLANS, THE TOWN HALL, NEW YORK CITY. McKim, Mead & White, Architects.



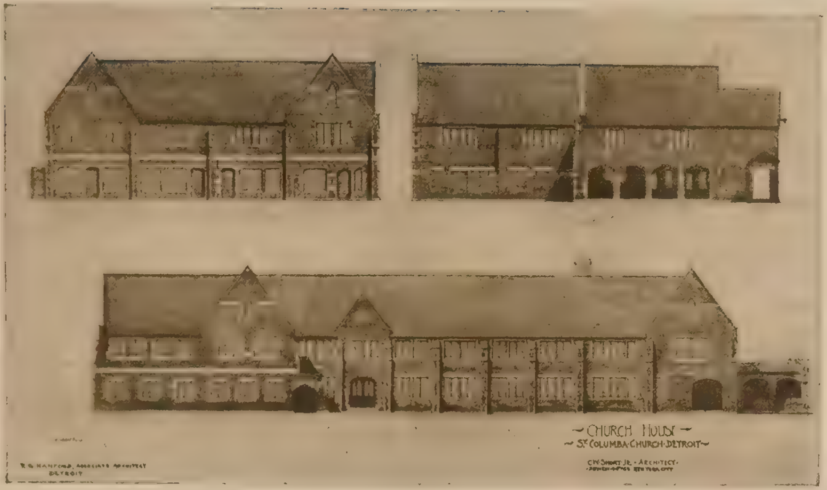


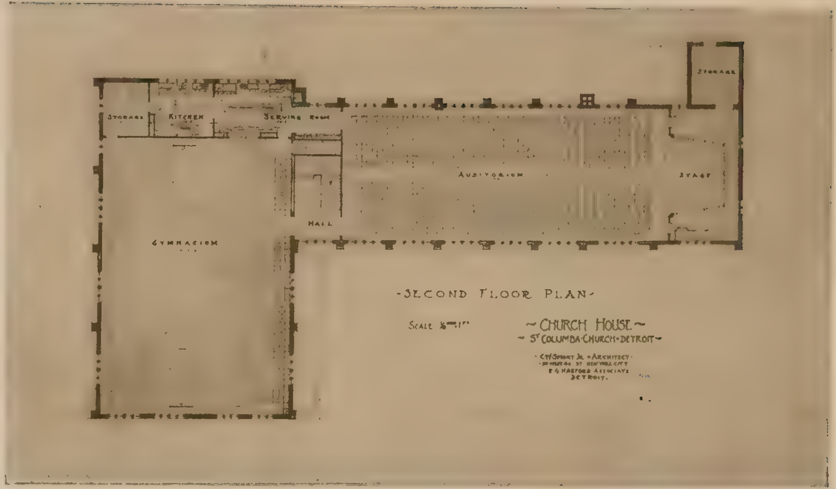


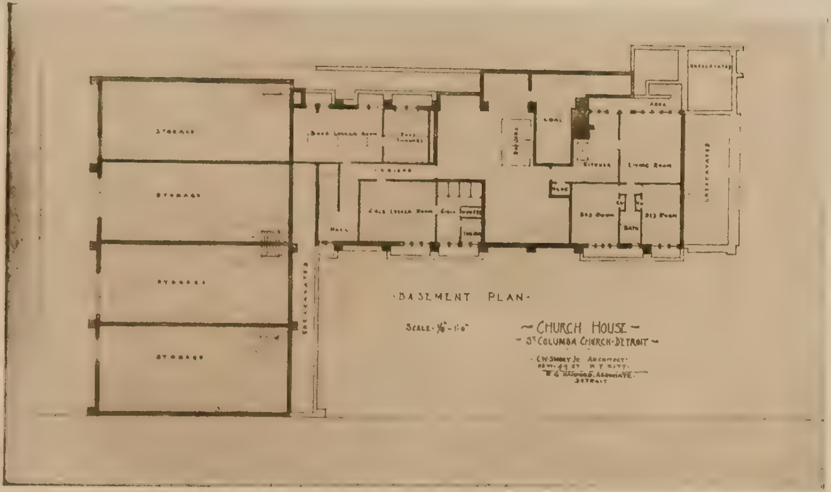


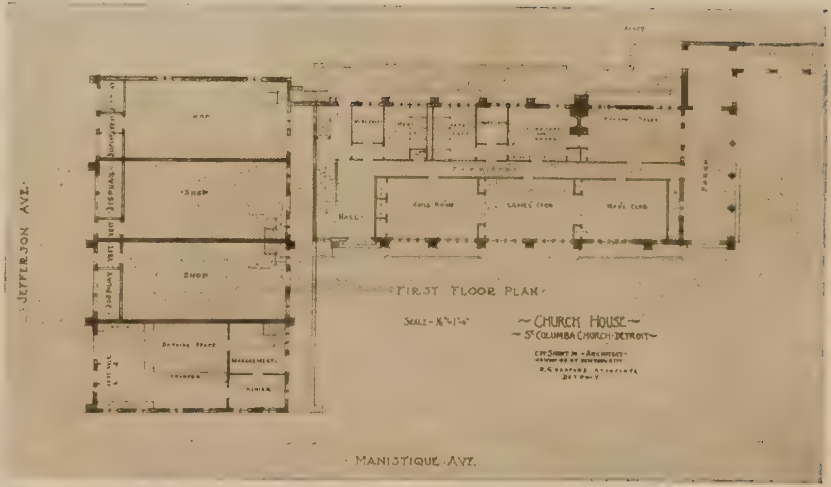
DESIGN FOR ST. COLUMBA CHURCH, DETROIT, MICH.

C. W. Short, Jr., Architect.



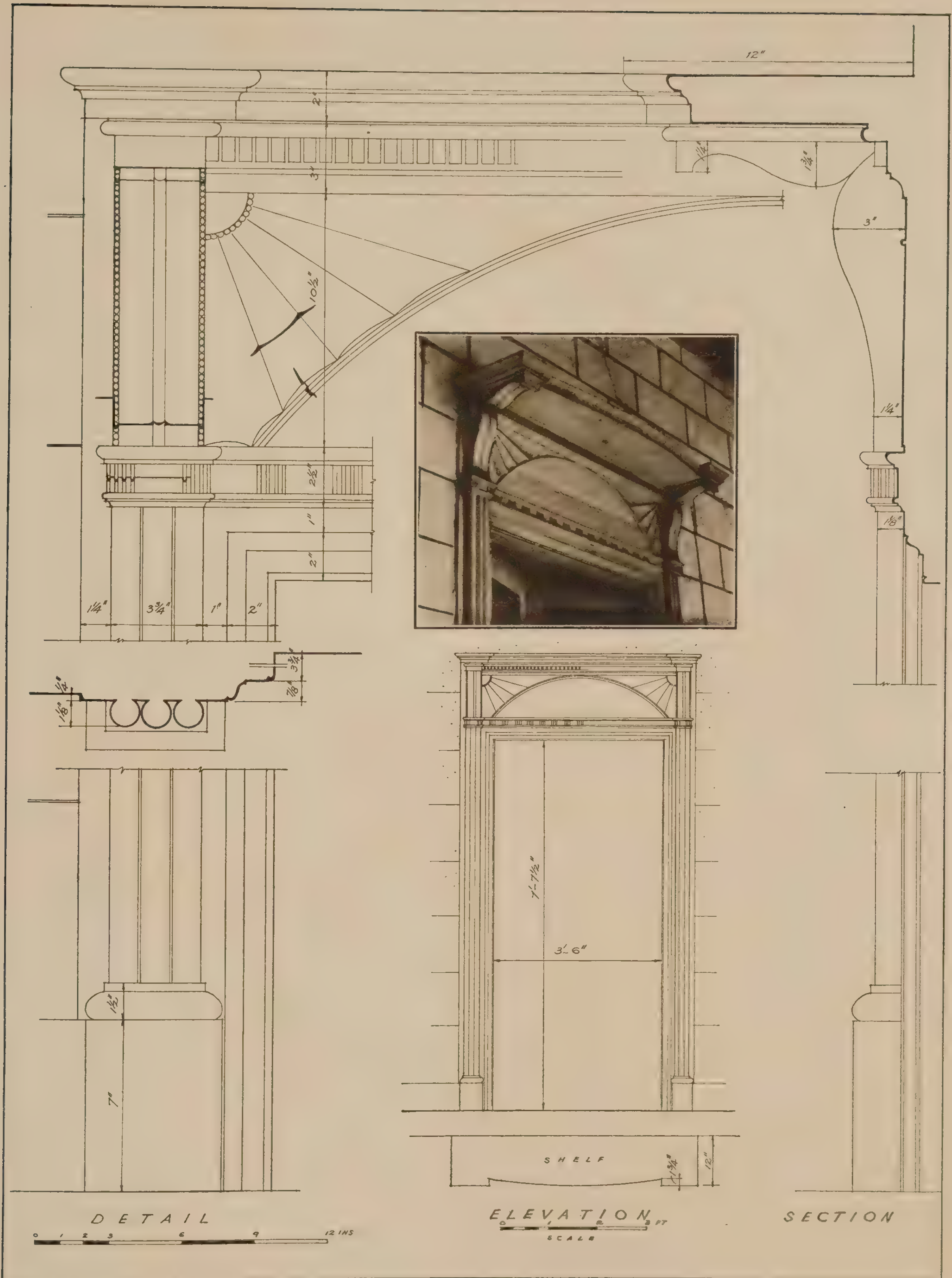






DESIGN FOR ST. COLUMBA CHURCH, DETROIT, MICH.

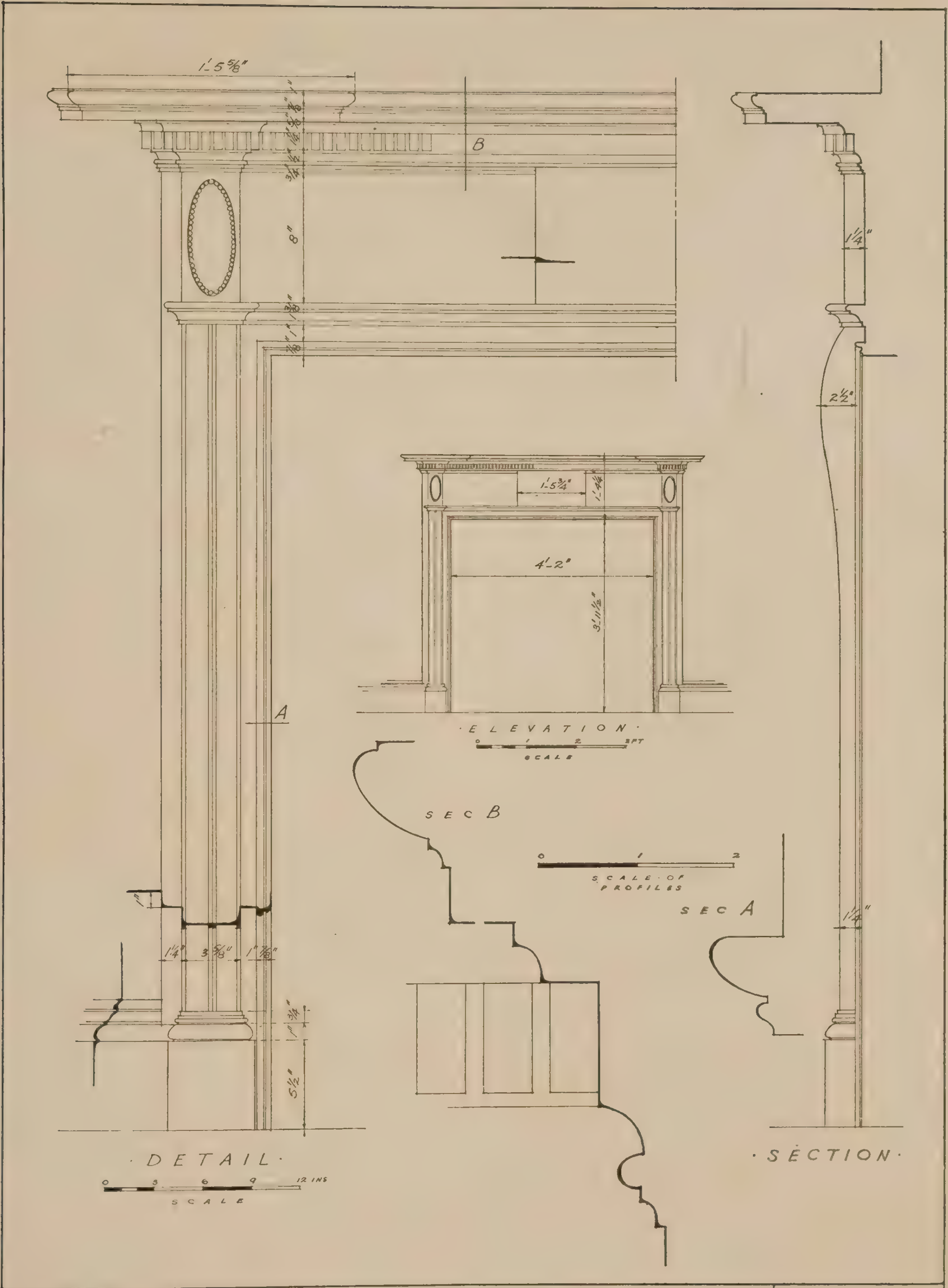
C. W. Short, Jr., Architect.



EARLY
ARCHITECTURE
OF
SOUTH · CAROLINA

EXTERIOR · DOORWAY
IN THE
FRASER · MANSION
· BEAUFORT · S · C

MEASURED BY
DWIGHT · JAMES · BAUM
DRAWN · BY
VERNA · COOK · SALOMONSKY



EARLY
ARCHITECTURE
OF
SOUTH·CAROLINA

·MANTEL·
IN·THE
FRASER MANSION·
BEAUFORT S.C.

MEASURED BY
DWIGHT JAMES BAUM·
DRAWN BY
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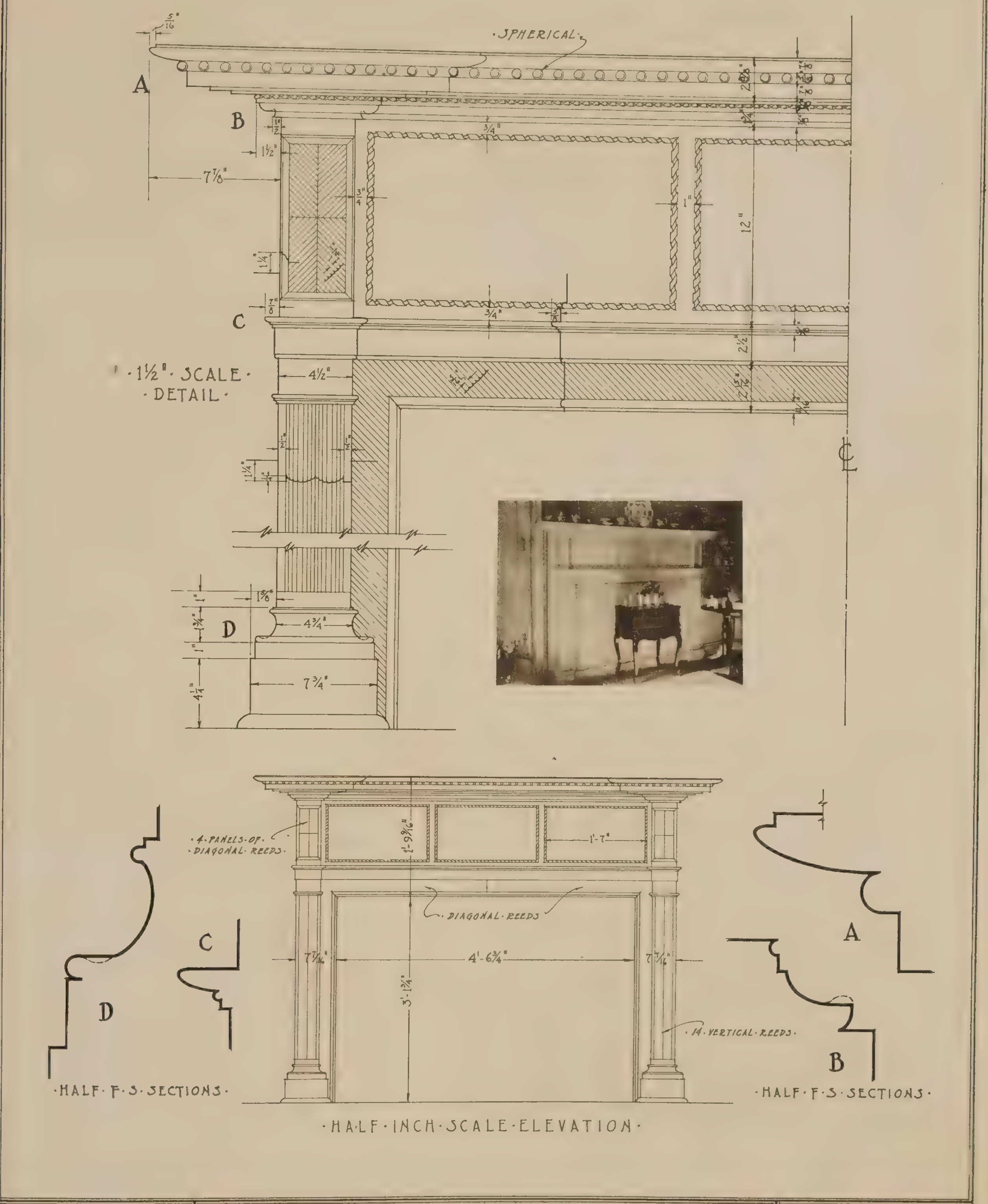

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·MANTEL· *in·the* ·PARLOR· *of·the*·
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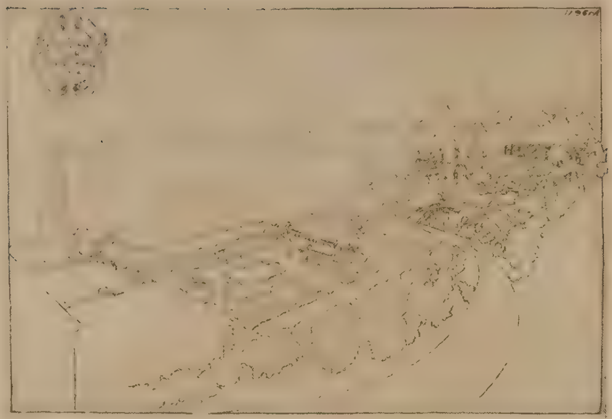
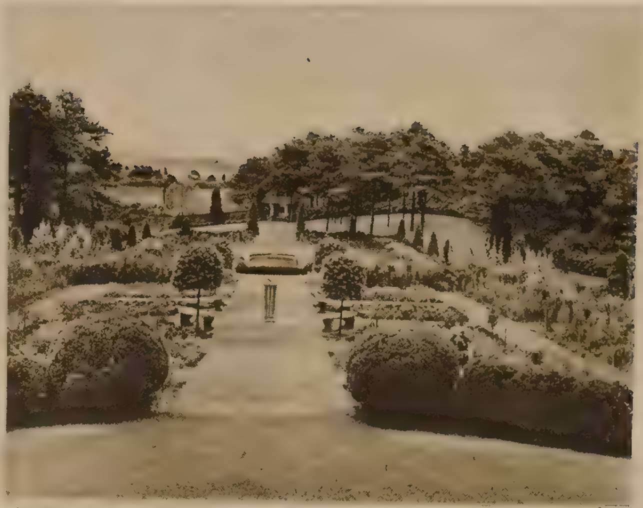
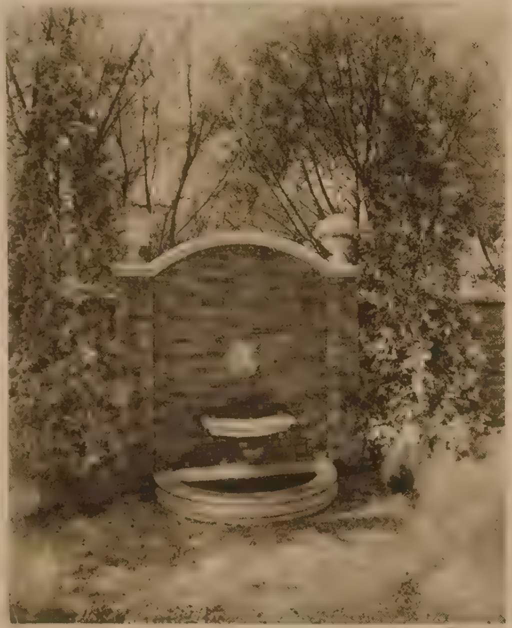


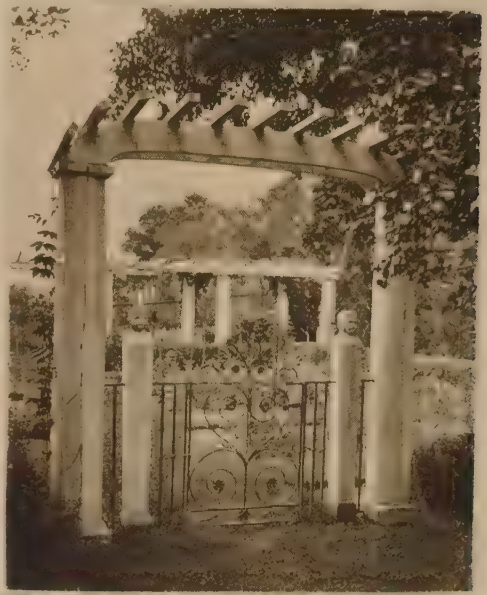
Bird's Eye View of Estate - Sketch from Memory



A Developed Garden - Showing Sun-dial, Pool, etc.



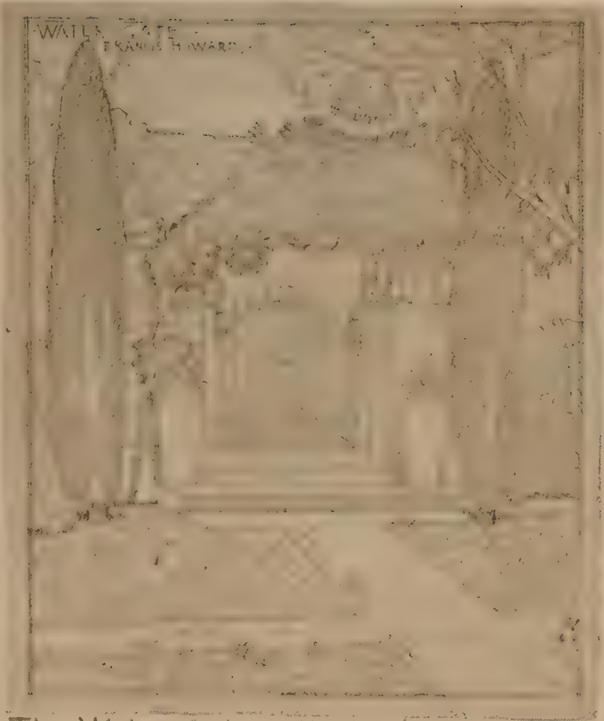
Dipping Well - End of Vista - Vegetable Garden



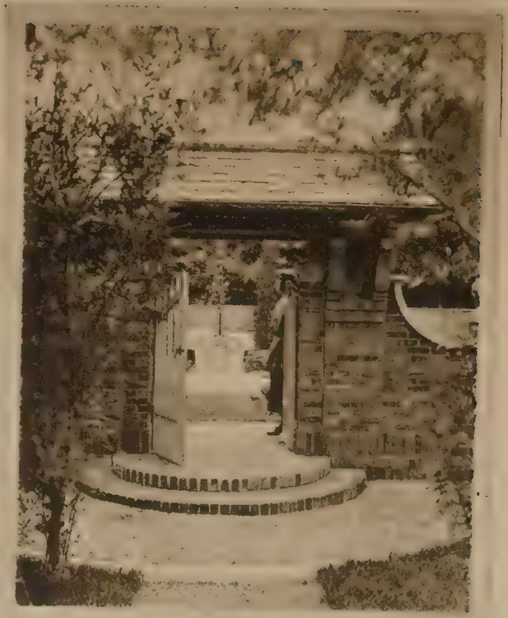
The Gate of Roses - With Greek Hermes
by Francis Howard

MAKING A GARDEN. FROM SKETCHES TO COMPLETION

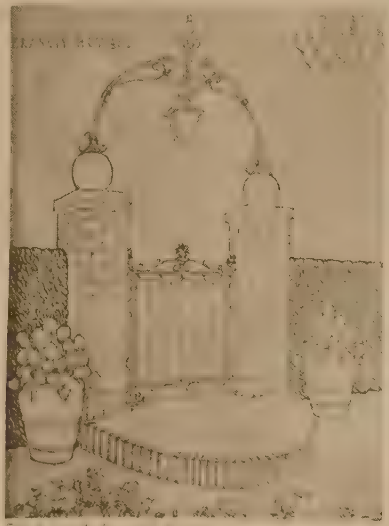
MAKING A GARDEN FROM SKETCHES TO THE COMPLETION BY FRANCIS HOWARD



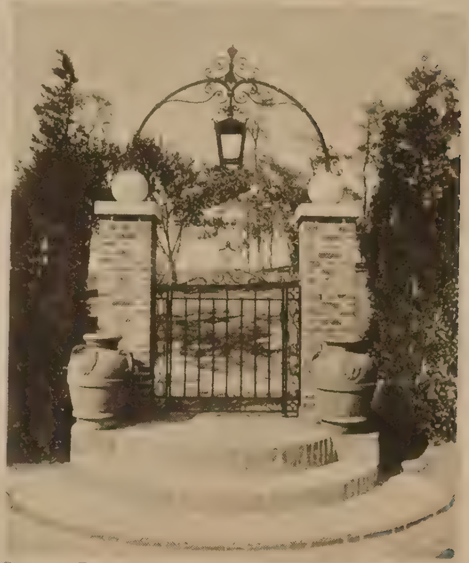
The Water Gate in the Garden-First Sketch-



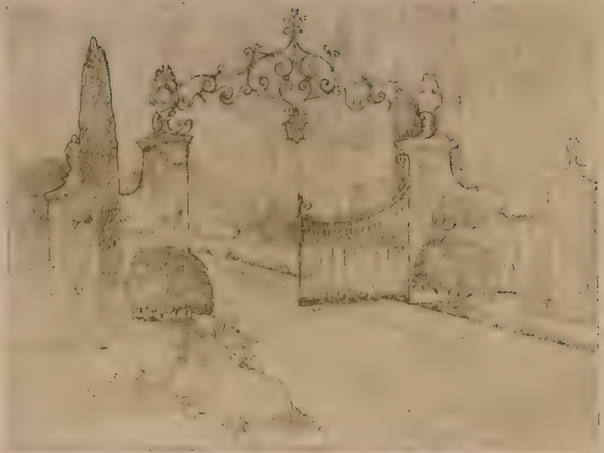
The Water Gate - Showing Finished Work-



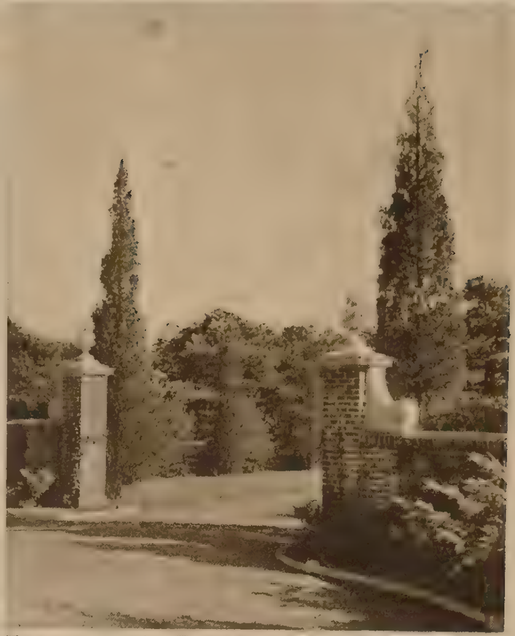
Sketch of Small Gate



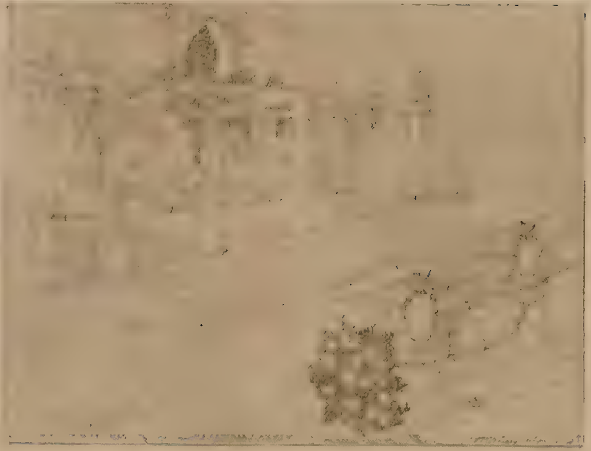
Small Gate-as Built Complete



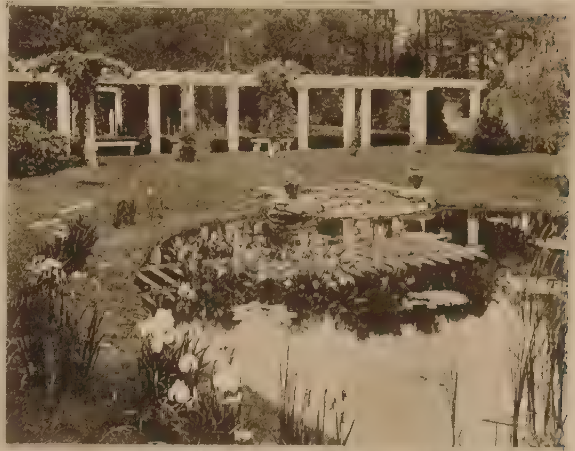
Original Sketch - Entrance to Estate -
by FRANCIS HOWARD



Entrance to Estate - Brick and Stone



Approach to Lilly Pool - The Pencil Drawing
by FRANCIS HOWARD



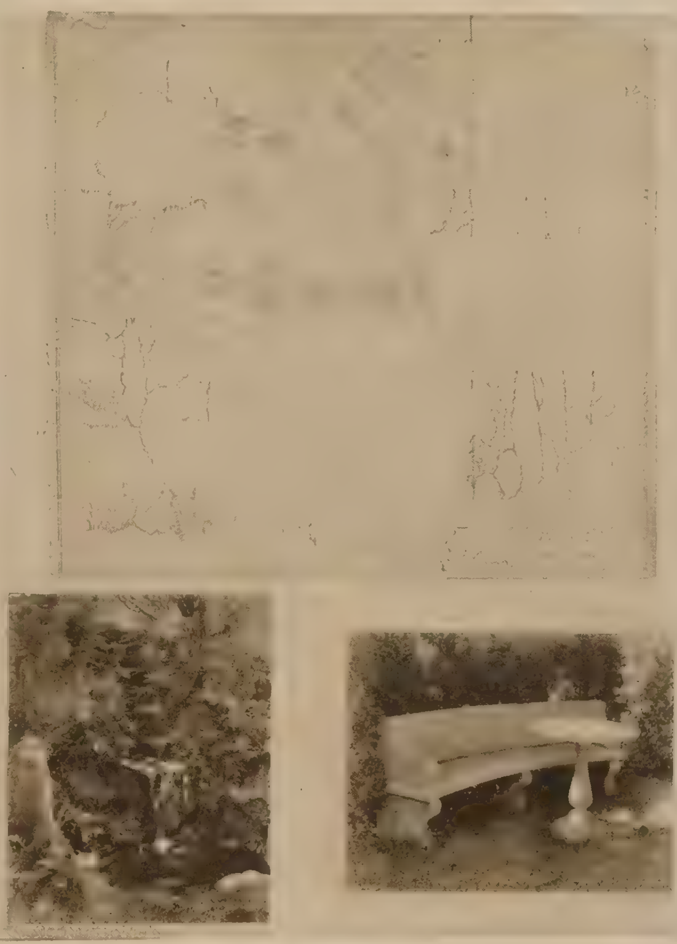
Approach to Lilly Pool - The Completed Work
by [illegible]

MAKING A GARDEN FROM SKETCHES TO COMPLETION.

Making a Garden

By Francis Howard

Of course a garden should be a place of dreams and kindly memories, not a place either of display or noisy talk, and any ornamentation of its natural beauty should be in harmony with its fundamental feeling of repose. Thus, I always approach a garden problem reverently, whether it is large or small, and try to picture it after the passage of the years, when its lines will be softened and its contours made gentle by the hand of time.



Sketch and details of secret garden.

Then, too, a garden, however lovely in its colorful expanses of flowers, its grouping of shrubs, and its long lines of hedges, when not enriched or accented by the harmonious use of architectural ornament, has always seemed to me to be like a song without words, a thing of partial beauty or of a beauty half expressed. The song, charming as it is, even when written by a Mendelssohn can never stir one, or satisfy the heart like the lyrics of Schubert or the idyls of Schumann, filled with the personal gayety or pathos of a poet's inspiration and appealing thus to our more human qualities. Therefore, in those instances where the client has asked my judgment concerning the appearance of his country place, I have tried to picture to his mind something more than the grading of a few lawns, the hedging in of certain spaces, and the planting of various flowers, however beautiful, might imply. In fact, almost everybody who has owned or inherited a property, no matter how small, for a number of years, is almost sure to have experimented already both in flowers, trees, shrubs, and vegetables, so that in the mere field of natural evolution their places have either reached a phase of considerable cultivation, accompanied by good taste, or an era of effulgence almost amounting to chaos.

Perhaps a book could be written on the subject of entrances alone; a subject replete with historic suggestion, but also tainted by contemporary abuse, relieved, now and then, by occasional appropriateness. For even the simplest entrance from a public road should curve in the right way, be wide enough to drive in, and mark in some manner the transition from the highway to the home grounds. The unsightly cedar posts with peeling bark and sagging joints, the old rail fence that straggles around the corners, the falling field stone wall that ends nowhere have been replaced by this, that, and the other device, sometimes with a more sorry result than the old, tumble-down original. But we have begun to recover from the period of immense stone boulder posts of Druidic proportions and also from the queer, cobblestone pyramids that used to be erected by the local contractor in the last century to mark our private roads, and we find that almost any material is good if properly and gracefully designed and so planned that outdoor spaciousness, sense of scale, and graceful lines are used in the preservation of an easy, pleasing, and commodious approach.

My way of doing things has been to wander around over an estate by myself until its contours and natural beauties are deeply impressed on my mind, and then, noting the relation of the house to its environment, try to apply a somewhat idealized and correlated plan of ornamentation to the existing conditions, so that one is gently led from one to another point of interest by easy transition, and not wearied by seeing too much at one time. This harmony can be best attained, I find, by doing nothing in a hurry and allowing the impression of beauty to rest until, in some happy moment, after leaving the actual scene, a bird's-eye picture of the whole unfolds itself before the vision and one seizes eagerly upon a ready pencil and, in very simple outlines, reproduces on paper the unfoldment of one's dream of what the place ought to look like if one could do it right.

Then comes the delight of perspective sketches of "Entrance and Approach," the "Terraces," "Garden Vista," a "Pool or Fountain," the "Sun-Dial," "Walk through the Woods," "Bench under the Pines," a rose-covered "Pergola and Lily Pool Steps," and when one is done with these, the "Vegetable Garden" with its brick wall and "Water Gate" leading through the willows down to the "Pavilion in the

Lake." One can by an unfrequented path come upon a little dell where a "Secret Garden" can be made, with its wild flowers, ferns, and evergreens, and its miniature cascade leaping down over rocks that are brought from far away, and all so skilfully placed that it looks as though it had been always there.

The permanent value of a garden seems to me to be its groups of trees and foliage, whose beauty is not dependent upon a hothouse or a seedsman's catalogue, however useful the latter may be, and these arrangements of foliage are always happier when forming the frame of a picture or assisting the eye to follow a vista to some distant and charming prospect. No school can teach this, only constant study out-of-doors and an unconquerable love of nature, seconded by an innate sense of scale and the instinct for form.

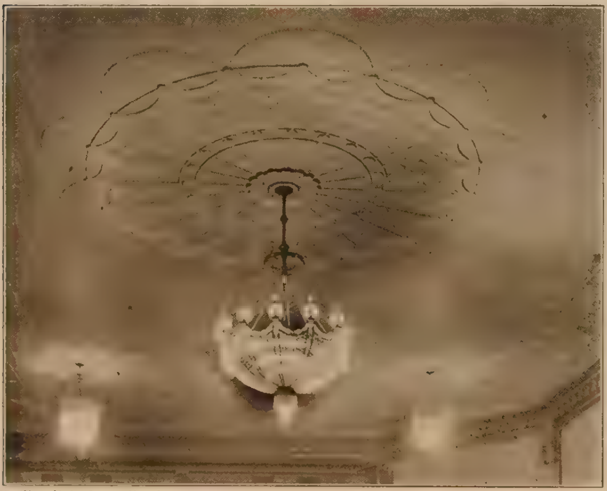
All elements of the hurry and bustle of the busy world should be far removed from the peaceful garden and its surroundings, and its effects should be achieved by patience and study from year to year, and by the embellishment of carefully selected places by the use of sympathetic ornaments having as true a relation as possible to the historic and æsthetic sense of the dweller in the garden, and made in such materials and of such color as harmonize with a setting of such sympathy. Although in Italy the classic background demands the use of marbles in the various ornaments, I feel that in our northern gardens a less cold and formal material should be employed, and the interesting points in our estates should be enriched by using stone, terra-cotta, lead, and variegated slate in many attractive forms, all more or less native to our domestic taste and looking less in our American surroundings like a man in evening clothes who has dropped in to breakfast!

The New Town Hall, New York City

McKim, Mead & White, Architects

NEW YORK has wanted, and now has for its discussions of controversial questions, a hall designed primarily for public speaking and not for entertainments and concerts.

The building, at 113–123 West 43d Street, provides the best equipped town-meeting hall in any community. It is within a half-mile of the two great railway terminals, many of the finest hotels, and the retail shopping district. Within the radius of a mile are the Waldorf-Astoria and the McAlpin Hotels to the south, the Plaza and Central Park to the north, Ninth Avenue to the west, and Third Avenue to the east. Times Square, the centre of the city's entire transportation system, is within a stone's throw of the Civic Auditorium.


Ceiling light in auditorium.

Perfect acoustics is one of the features of this new forum. The late Professor Sabine of Harvard, foremost expert in America on acoustics, was the authority whose counsels were sought and followed on this most important point. The result is one of the finest speaking auditoriums in the country.

The exterior is Colonial, constructed of brick with cut cast-stone trim—the white stone being veined similar to marble.

It is fitting that the foyer of the auditorium should be a memorial to public-spirited citizens not now living who were the leaders of their day in public usefulness. This memorial foyer stands in the centre of the city's life as New York's tribute to these far-sighted men and women to whom it owes so much. Coming generations will thus be reminded of those who have gone before, and inspired, it is hoped, to follow the way illuminated by these torch-bearers of civilization.

Every feature that makes for comfort has received careful consideration. Disturbing noises have been eliminated by the use of swinging doors at the beginning of each aisle. When a meeting opens, these doors are closed, shutting out confusion from late-comers finding their proper seats.

A welcome feature of the auditorium will be the fact that it is entered from the street without ascending even one step.

The interior of the hall is semiclassic in design. The direct emphasis of space is added to quiet dignity of treatment, and the aim is always at character. One is conscious of nothing but symmetry in the simple lines of the proscenium which overarches the wide platform.

Soft colors have been chosen to harmonize with the fine design. These colors tend to create an atmosphere of quiet and repose and help the attention of the audience.

No pillars or supports interfere with the audience's view of the speaker. Every seat on the floor and in the balcony has an unobstructed view of the platform.

Wide and convenient aisles, roomy, comfortable seats, and an indirect lighting system are all a part of the appointments.

The seating capacity is 1,700, with room, on occasion, for 200 "standees."

Philadelphia's Sesquicentennial, 1926

A Description of the Plan Prepared by Paul P. Cret, F. A. I. A., for the Fairmount Park Art Association, Showing the Availability of the Parkway and the Schuylkill Banks as a Site for the World's Fair Celebrating the 150th Anniversary of the Declaration of Independence

By John F. Harbeson

FOR the first time a world's fair is being planned with a permanent city-plan improvement as its avowed objective. Once before there was such a motive: one of the Paris fairs was partially undertaken to clean out an overcrowded part of the city inhabited by the worst class of criminals, strongly intrenched and defying the police, but this motive for the fair was not avowed for fear of reprisals.

Every world's fair of recent years has left some permanent improvement, either in city planning (Chicago, 1893; Paris, 1900) or in buildings (St. Louis Museum, the Grand and Petit Palais in Paris, Mediæval Castle in Turin, California Building, San Diego, etc.). It is legitimate to expect such permanent improvements in view of the great expenditures made by the city holding the fair as one of the returns in addition to the benefit to the local trade. This time the permanent improvements have suggested the scheme.

Mr. Cret was studying the project of the Schuylkill River Embankments for the Fairmount Park Art Association. It was this association that was largely responsible for having the parkway put on the map and for pushing it through almost to completion at the present time. Philadelphia has spent and is spending many millions of dollars to cut this diagonal boulevard through the city, connecting the City Hall, at the centre of town, with Fairmount Park. From Logan Square to the park—one-half of its length—the roadway is 300 feet wide, flanked on either side by gardens 500 feet wide.

At the park end of the avenue is being built the city's Art Museum. It is on a rocky promontory, 30 feet above the roadway, approached by elaborate garden terraces. When one climbs this eminence and turns to look back, his eye sees immediately to the right the Schuylkill River—dirty and black, the farther shore lined with dumps and waste spaces, and beyond this are railroad yards and smoke. One is appalled that this plaza, constructed at such cost, should have as prospect such a noisome sight.

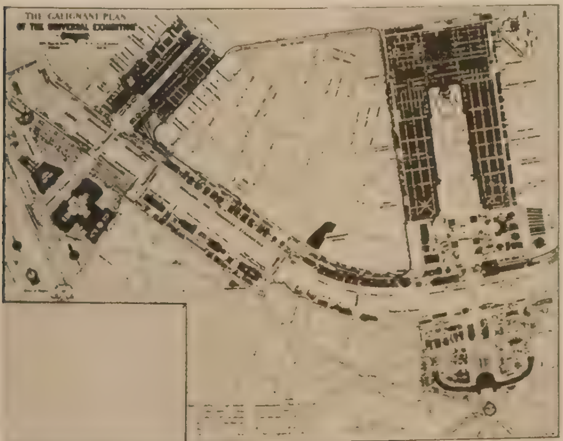


Fig. 4. Plan of the Paris Fair, 1900, along the banks of the Seine, showing the similarity of the Cret plan for Philadelphia.

It was during consideration of this point in working on the embankment project that the idea came of locating here the World's Fair, already planned by the mayor. The Centennial has always meant much to Philadelphians; it showed them at their best to visitors from other cities, and they have always contemplated making a return engagement in 1926. Here is an opportunity to divert this deep-seated feeling into a city investment, for the plan would prepare the way for the completion of the parkway and its buildings, and the realization of the Schuylkill Embankment project in five years—instead of twenty-five; which would clean up a foul section on the west bank of the river in the heart of the city, and would, on the east bank, by improving the river front, make available for development the region behind—a tax-producing section of a neglected area.

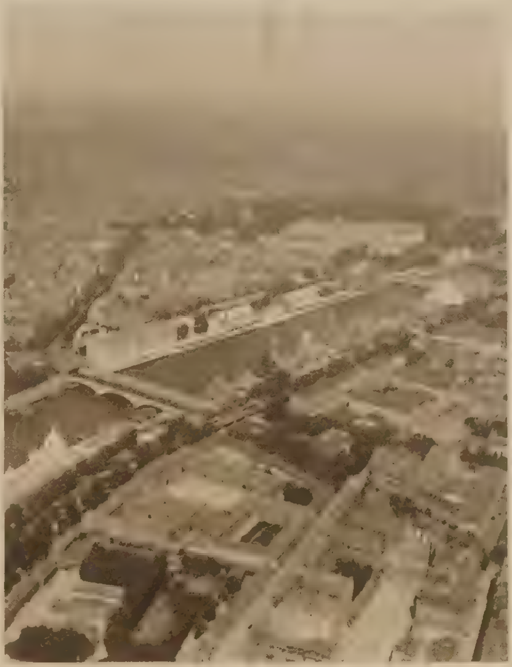


Fig. 5 An airplane view of the Paris Fair, showing the effect of utilizing the natural beauty of a river's banks.

And it must be remembered that the Schuylkill is singularly fitted to play the rôle required. At Chicago, Buffalo, St. Louis, and San Francisco large sums of money were expended in constructing artificial basins to serve as reflecting pools, and to give life and color. Here this expense is unnecessary, the scheme resembling in many respects that of the Paris Fair of 1900, where the Seine played a similar part. The views of the Seine during that fair show some of the possibilities, and incidentally may be compared with those of present conditions. A necessary part of the scheme is the covering of the Baltimore and Ohio Railroad tracks on

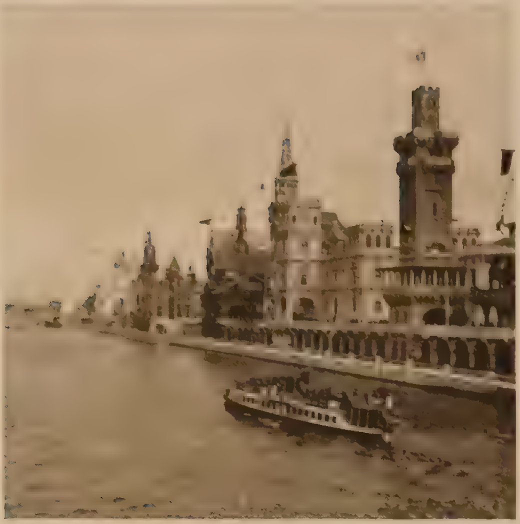


Fig. 6. This view of the Paris Fair shows the fair building constructed over the railroad. The arcades just above the embankment indicate the position of the railroad-tracks.

the east bank, using this platform for the amusement concessions, with a promenade at a lower level along the river's edge. Figure VI shows the same treatment as used at Paris. (Why is it that in America all rivers, usually on both sides, are defaced by railroad-tracks?)

The main entrance is at Logan Square, ten minutes from the railroad-stations, hotels, restaurants, and the shopping centre. Logan Square is surrounded by public buildings and sites of projected public buildings which should be completed by 1926. Within this entrance on either side, and extending to the plaza in front of the Art Museum, are to be exhibition buildings, 1,500 feet long, of temporary construction, on the land to be used ultimately for the gardens before spoken of, but as yet unimproved. The Plaza and the Fine Arts Museum, parts of the permanent parkway scheme, would be hastened to completion for the fair—were it not for such an incentive they might stand unfinished for a score of years in this era of economic pressure. The museum would become the fine arts group, with outdoor exhibits on its terraces and stairs.

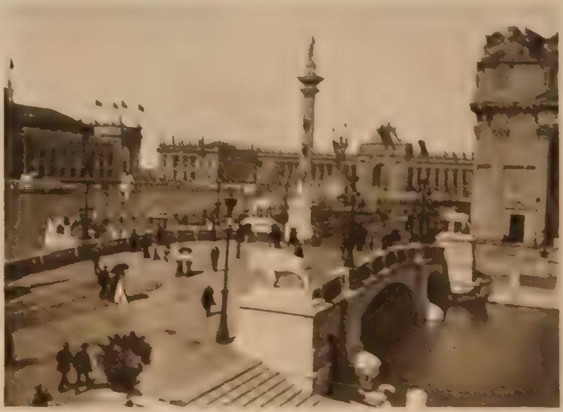


Fig. 7. The Court of Honor at the Chicago Fair, 1893, showing effective use of water. The basin was artificially constructed at great expense. The Cret plan will give Philadelphia a more beautiful setting.

From the Plaza a bridge would span the Schuylkill to the west bank, ending in an esplanade facing an artificial cascade. The abattoirs and ash-dumping grounds on this side of the river would be acquired by the city and become the site of exhibition buildings, screening the railroads in their rear and facing gardens and terraces along the river-bank. It is suggested that the machinery exhibits be placed there, close to the railroads. The construction of a bridge across the Schuylkill at Arch Street, with exhibition buildings on the lower side as a part of the bridge, would form an end to the vista down the river, and would serve the additional purpose of hiding the unsightly railroad bridges and unimproved river-banks to the south.

On the east bank, coming up the river to the Plaza, would be the amusement concessions, built over the B. & O. Railroad tracks, as before mentioned. The State and foreign buildings would be placed on the west bank of the river above the Plaza bridge, in land already part of the park, but not heavily planted or improved.

The total development gives an area of 165 acres, which could be increased to 214 acres by the inclusion of the so-called "Lemon Hill Section," though the present trend in such matters is toward smaller fairs.

As a comparison may be noted the surface of some of the recent fairs:

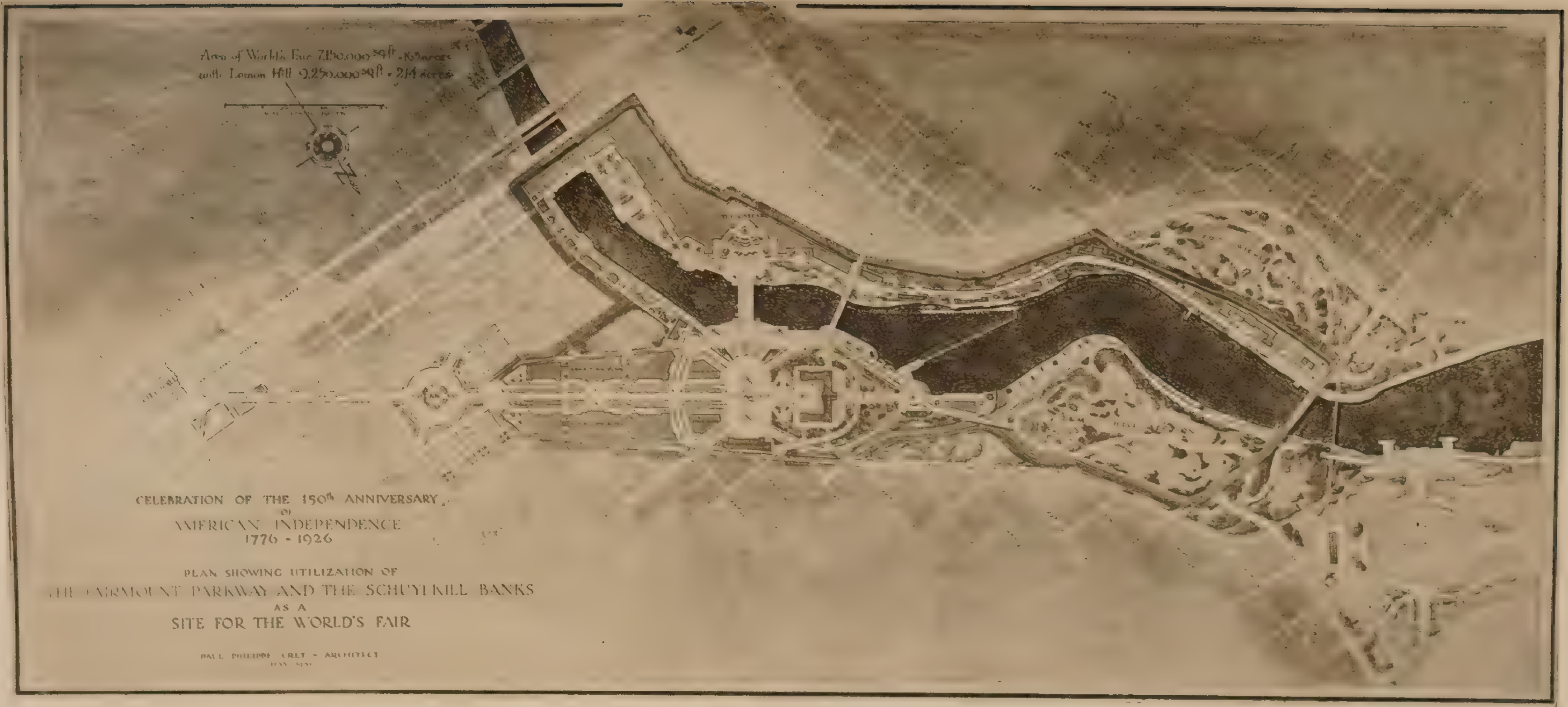
Buffalo, 1901	200 acres
London, 1908	134 "
Paris, 1900	247 "
Leipzig, 1913	200 "
San Francisco, 1915	625 "

In adjacent areas would be a stadium and field for athletic sports and pageants, already projected as a city improvement, and an aviation field, either the present field on Belmont Plateau or a larger one, made by covering the immense area of the East Park Reservoir.

While the proposed fair ground is within a few minutes' walk of the centre of the city, and its ten entrances would tap all quarters of the city as well as all the railroad-stations, it yet does not interfere with existing lines of traffic.

The north-south traffic from the Germantown-Chestnut Hill district through the park to town would be deflected from its present course down the parkway to Pennsylvania Avenue, just outside the fair, until it reached Logan Square. The east-west traffic from West Philadelphia via the Spring Garden Street bridge at the museum would bridge the fair circulations at either side of the museum, passing behind that building, the trolleys going under the Plaza in a subway, an improvement that is part of the permanent parkway plan.

Three other advantages of the plan may be mentioned: that no portion of Fairmount Park, fully developed, need be used, thus avoiding the cutting of trees and ruining of lawns; a large portion of the grounds required is still unimproved, and condemnation of properties would be at a minimum, considering the central location; the existing trolley service to the more than ten entrances and the proximity of the hotel and restaurant district to the fair would make the night attendance an assured success.


Area of World's Fair 7,150,000 sq ft - 163 acres
with Lemon Hill 9,250,000 sq ft - 214 acres
CELEBRATION OF THE 150th ANNIVERSARY
OF
AMERICAN INDEPENDENCE
1776 - 1926
PLAN SHOWING UTILIZATION OF
THE FAIRMOUNT PARKWAY AND THE SCHUYLKILL BANKS
AS A
SITE FOR THE WORLD'S FAIR
PAUL PHILIPPE CRET - ARCHITECT

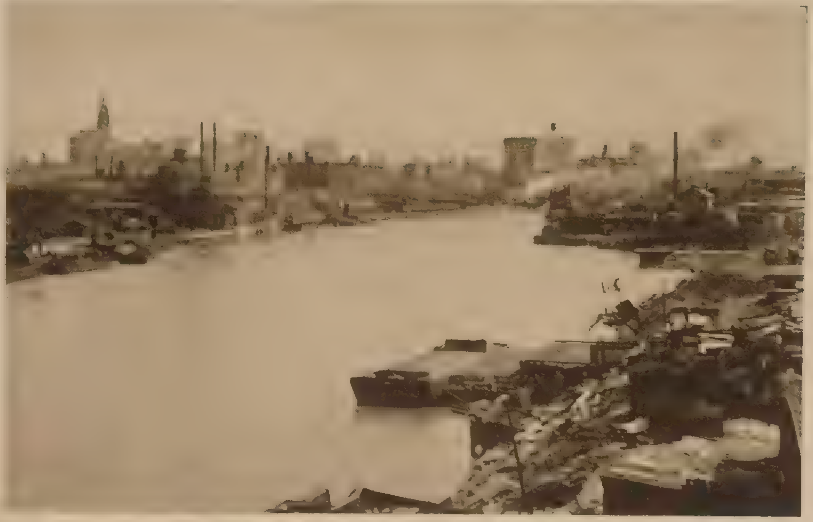


Fig. 2. Present condition of banks of the Schuylkill from Plaza Bridge. This is the location selected for the World's Fair.

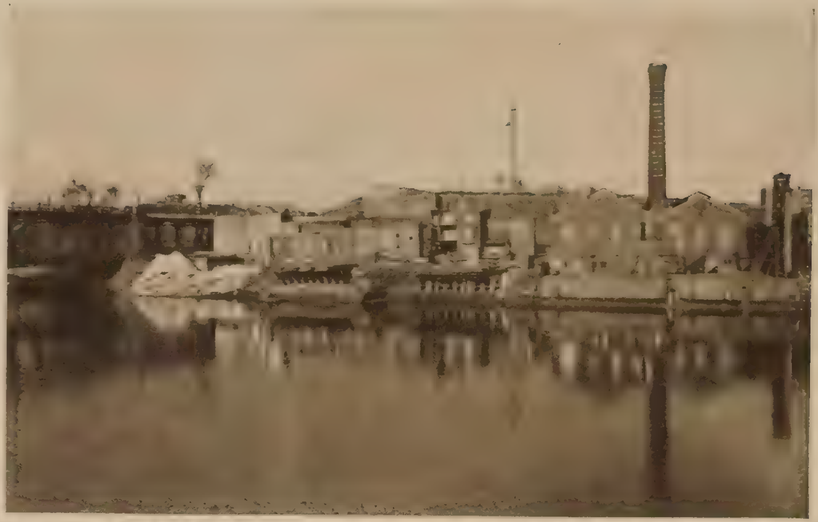


Fig. 3. East bank of Schuylkill—present condition. The hill in the background shows the museum in course of construction.

U OF I
LIBRARY

The Use of the Order in Modern Architecture

By Egerton Swartwout

SECOND ARTICLE

THE DORIC ORDER

OF all the orders that exist or have existed from the earliest Egyptian to the late Renaissance, the noblest and the most monumental is the Greek Doric. It is also the simplest, but it is this very simplicity that makes its reproduction in modern times so difficult—for in its supreme simplicity there is a subtlety, a refinement that is almost imperceptible, which makes the Parthenon a living organism after all these centuries of neglect, and by contrast renders modern work cold and mechanical. But if the perfection of the Parthenon as a building cannot be approached, still the order can be used with good and even noble results if the work is done carefully, with a knowledge of the principles involved and of the detail that must be used. It should be realized, however, that the Greeks used the order in a way foreign to our construction, to our types of building, and, strange as it may seem, to our taste. It was in its completeness essentially an exterior order, it was not a portico or part of a building; it was the building.

The Doric temple was in its main features a covered colonnade, and the entablature was designed not in reference to the order alone, but to the entire temple. It was the cornice of the building, the crowning member of the structure. When the Greeks did use the order with a superstructure, as in the interior of their temples, they never used the entire entablature. They reproduced the columns at a smaller scale, but substituted a string course of varying design for the entablature they had employed for the exterior of the temple. How seldom is that principle followed when we use the order now! There are scores of office-buildings with rows of Greek Doric columns surmounted by a complete entablature and twenty stories on top of it. The cornice, a thin projecting member quite sufficient for the crowning motive of a temple, becomes a hard, thin shelf, entirely inadequate as a string course for the great building of which it is a part. For the temple the cornice was, as I have said, adequate, because it counted to a great extent with the marble tiled roof above it. The Greeks themselves felt this thinness, for when they used the cornice on the gable they surmounted it with an additional member. This additional member, or cymatium, is not merely a gutter, as it has been described; it was an integral part of the design. I have no doubt that if the Greeks had found it necessary to cover the roofs of the temples with some dark covering instead of marble tiles, they would have continued the cymatium in some form along the flanks of the temple.

Their methods of construction were also quite different from ours. The stone was cut by hand, and, as we say, on the job; most of it was cut in place after being set. But the main difference was that the Greeks did not regard the material as marble or stone, beautiful in itself, but merely as a structural surface to be decorated. They took the most meticulous care to make the joints so fine that, in some cases, the stone has grown together; this was not merely due to good workmanship, but because they wanted to lose the joints. If marble that could be brought to a smooth finish was not to be obtained, they covered the rougher stone with a coating of stucco, and painted this as they did a thin marble building. We cannot hope to grind our joints as they did, and if we could, we could not set the finished drums without spalling, nor do I think we should wish to disguise the joints, for as we use stone or marble the joint is an important feature of the design. But we must appreciate this love of the Greeks for surface decoration to understand the delicacy of their detail. Nearly adjoining the broad, massive surfaces of the architrave and abacus come thin, delicate, sharply undercut mouldings, mouldings that could only be cut in marble or run in stucco. But when it is appreciated that these mouldings were colored or gilded, it is easy to understand their existence. Our use of the details of the order must be governed by the material at our disposal and by the scale of the column. The columns of the Parthenon were approximately 34 feet high, and those of the Propylæa at Athens were somewhat over 29 feet, while the great columns of Selinus and Agrigentum were over 50 and 60 feet, respectively, in height. As far as the mere height is concerned, there is practically no limit, but there is a decided limit to the scale of the order imposed by the length of the architrave stones which can be commercially obtained. The longest architraves in the Parthenon were something over 14 feet long, and of the Propylæa over 19 feet, and of the big Sicilian orders about 21 feet. The chief concern of the Greeks was the distance between bearings; this was a structural condition and was about the only approximately constant quantity between all the orders; for example, while the diameter of the columns of the great temple at Pæstum is in comparison to that of one of the small columns in the triangular forum at Pompeii in the proportion of 3.72 to 1, the length of the architrave between bearings is not more in proportion than 1.18 to 1. In other words, the larger the columns, the closer was the spacing. This timidity of the Greeks as to the strength of the lintels had undoubtedly a great deal to do with the large size and great projection of the primitive abacus. Of course, with our modern methods of steel construction, it would be a simple matter to take the superimposed weight entirely off the architrave, but even so, it would be difficult to get a stone over 15 feet in length that would safely carry its own weight. I would dismiss entirely any proposition to suspend the architrave from iron beams; such a suggestion has no place whatever in monumental architecture.

The size of the order naturally influences the scale of the detail. Some of the mouldings of the Parthenon are so small, notably the filets below the echinus of the column and the bead and reel mould above the triglyphs, that it would be difficult to cut them, even at the scale of the Parthenon, in any hard material; and at a smaller scale they would have to be considerably simplified. In fact, the whole order as it exists in the Parthenon is not susceptible to working in granite; the delicacy and charm of detail would be entirely lost even if it could be reproduced. But the order is, in its general character, so massive that a granite scheme could be used, and used to good effect. The mouldings could be simplified and made bolder, and, while the charm of detail would be lost, a certain rugged stony quality could be obtained which in many ways would be more appropriate to our climate and to our conditions.

There is one point of design in the order which is generally overlooked, and that is the influence of sculpture and color. We generally think of the order as it appears in the line reproductions. In line the triglyphs count as a gray tone on account of the channelling, and they also echo in tone the flutings of the column shaft, while the metopes are lighter. In the actual work, as the Greeks conceived it, the reverse was true. The metopes were filled with sculpture, generally colored, on a red ground, while the triglyphs were blue; there was a marked contrast, and the metopes counted darker than the triglyphs. In our modern work we are very seldom able to introduce sculpture, and we generally intend the triglyphs to be darker, but the channels of the triglyphs are shallow, at an angle of about 45 degrees, and the triglyphs themselves project very little from the face of the metope. There is hardly ever any shadow except at the top of the channels, consequently at a short distance away the frieze hardly counts at all, and yet the frieze is one of the most important features of the order. I have always had an idea that, with a little care in the selection, darker pieces of stone could be used for the metopes, the same kind of stone but of a darker color or with more pronounced veining, or possibly even a different kind of darker stone. In a marble building some heavily veined or colored marble could be used to good effect. I have before me, as I write, a reproduction of a beautiful French rendering of the Parthenon which gives a good idea of how well this contrast of triglyph and metope would look, but the effect is marred by the shields on the architrave, which are most unfortunate in composition. It is true there are traces of these on the Parthenon, but they are undoubtedly a late and debased addition.

I have said that the frieze is one of the most, if not the most, important feature in the entire order in point of design. It is, too, of prime importance in the layout of the structure, for it is the spacing of the triglyphs which determines the spacing of the columns. I cannot agree wholly with Mr. Ernest Flagg, who has recently, in a paper read before the American Institute of Architects, advanced a theory that the triglyphs were, in reality, an expression of the module by which the temple was laid out; that is to say, I don't think the Greeks thought of a column as being so many triglyphs high any more than they designed their temples on the scheme of proportion advanced by Mr. Hambidge, but it is true that the spacing of the triglyphs played a great part in the layout of the building. Normally, the triglyph occurs over the centre of the column and over the centre of the intercolumniation, the metopes between the triglyphs being approximately square. There are two exceptions to this rule. In the case of the corner column the triglyph is not over the column centre, as this would leave a half metope on the corner. Architecturally, the frieze must end with a triglyph, consequently, if the normal spacing was kept for the end column, the last two metopes would be very distinctly wider than the centre ones, and would be rectangular instead of square. The only solution was to narrow the intercolumniation of the end bays so that the spacing of the triglyphs would approach the normal. This sudden change in intercolumniation is relatively large, there is a difference of about 2 feet in the two adjoining bays of the Parthenon, but great as it is, it is not directly apparent. The casual observer would not notice it and, even if it is noticed, the effect is distinctly good; it gives a sense of solidity and strength to the corner, and to increase further this feeling of solidity the Greeks made the corner column slightly larger than the others, about one-fortieth larger in diameter. This adjustment of the spacing varies in method and in degree in all the temples; sometimes the triglyphs of the centre bays are equally spaced and over the centres of the columns. Sometimes they vary slightly and are not directly over the columns. Sometimes the spacing of the columns themselves is varied. There is no general rule here any more than in any other case in Greek art; any adjustment is satisfactory that restores the appearance of regularity to the frieze. In Perrot and Chipiez' monumental work may be found diagrams and dimensions of the spacing of the triglyphs in the more important examples. There is one curious fact which shows conclusively that the narrowing of the end bays was due to the difficulty of spacing the triglyphs and not for the purpose of giving solidity to the corners, and that is that this narrowing occurs only in the Greek Doric temples. In all other orders the spacing is normal, or nearly so, at the corners.

There is another exception to the normal spacing of the triglyphs. In the Propylæa it was essential that the space between the central columns should be wider than the general intercolumniation to provide requisite space for the proper passage of triumphal processions and the like. In this case the intercolumniation was abruptly widened by the addition of a triglyph and a metope, so that there are two triglyphs instead of one over the central opening. This is a simple and practical expedient which would not be architecturally satisfactory in a temple, but which is quite unobjectionable in a gateway; in fact, it emphasizes the gateway. In the smaller orders, such as the order in the triangular forum in Pompeii and in the temple of Cori, which are only 13 and 18 feet high, respectively, the columns are much slighter and the entablature is much lower, proportionately, than in the larger examples; the column spacings, however, are wide, as the space between the columns cannot be reduced below practical limits, and in these cases there are three triglyphs over each intercolumniation. This is a perfectly rational and natural arrangement; the proportion varies with the size, and it well illustrates the free and untrammelled method of the Greek designers. It also illustrates the necessity of the consideration of the size of the prototype. In the reproductions of the orders they are usually represented not in their proportionate size, but in the same size. It is more convenient doubtless for the reproduction, but it prevents any direct comparison, and is often the means of misleading the student.

The details of the order have been so carefully reproduced in so many publications that they are accessible to all, but in following these details careful consideration must be given to the size of the proposed order and to the materials to be used, as I have before explained. There are some points, however, in the way of refinements which do not generally appear in the reproductions. The finish at the top of the channels of the triglyphs is very unusual. The bevel is lost in an undercut in a rounded form which finishes in a sort of lip. It is hard to draw this, and still harder to make the stonecutter understand it. It can be studied in the casts at the museums, and the detail here should be modelled to insure the best results.

The matter of entasis receives scant attention in any of the reproductions. Penrose, of course, is the ultimate authority. Generally the entasis is very slight. Sometimes there is none at all. In any event the entasis should never be perceptible. In the Parthenon, where the columns are 34 feet high, the maximum entasis is about ¾ inch, or approximately one-twelfth of the semi-diminution, or one-one hundred and tenth of the lower diameter. By maximum entasis is meant the greatest projection of the curve from a straight line connecting the upper and lower diameters. The maximum entasis occurred in the Parthenon at two-fifths the height of the column, and in the Theseion at one-half the height. Just how this curve was obtained by the Greeks, or what form of curve was used, is not known. Penrose assumes it was laid out from the ordinates of a small hyperbola, and it is possible that this could be done, but as a matter of fact the curve is so slight that it does not matter much what kind of a curve is used, or how it is obtained. I have found the best results can be secured by laying out the columns carefully at a reduced scale; any reduced scale that will make the actual drawing from 6 to 10 feet high. If one-quarter full size or 3-inch scale can be used, the work is simplified, as the ordinates of the curve can be scaled fully as accurately as they can be measured full size. The extent and location of the maximum entasis having been established, a flat steel bar is bent the flat way after being fastened securely at the upper and lower diameter of the column, until it touches the point of maximum entasis, and the outline of the curve thus formed is drawn on the paper. Ordinates are drawn at the height of every course, and these ordinates carefully scaled. The measurements thus obtained can be adjusted mathematically if any discrepancy exists. I don't say this method is the best, but has proved generally satisfactory, and the ordinates at the joints being given in figures are a great aid to the stonecutter in laying out his work and also provide a method of checking the sizes of the drums at the building. The entasis is, as I have said, extremely slight, so much so that in the height of an ordinary course the outline of the column is, to all intents and purposes, a straight line; in fact, the outline would be perfectly well maintained if each course was a section of a cone, provided, of course, that the drums were not of unusual size. As a matter of fact, the horizontal curves in Greek architecture, which will be later referred to, are not really curves at all, they are simply a succession of straight bends placed at a slight angle to each other; the apices of these bends are on a curved line, the curve of the line being so extremely slight that the breaks in the line are imperceptible.

The Greeks at the culminating period of their art introduced a number of refinements which were of so slight a nature that for a long period their very existence was unknown. Penrose gives these in detail, and they are explained by Professor Goodyear in his monograph on the "Curves in Greek Architecture." Allusion has already been made to the narrowing of the end bay and to the increase in size of the corner column. In connection with the latter it is interesting to note that the projection of the abacus of the corner column is less than the normal. The reason for this is apparent. If the normal projection was used for the larger corner column the abacus would project farther beyond the face of the architrave than the abaci of the adjoining columns. It is a small point, and its omission probably would not be very noticeable, but it shows the care taken by the Greeks in the slightest detail.

The most unusual and characteristic refinement instituted by the Greeks was the abolition of exact symmetry. Their plans in conception were generally symmetrical, and the result they achieved was indeed symmetrical in appearance, but the hard, mechanical exactness that is the usual concomitant of modern classic work was not to be seen in Greek art. It was purposely eliminated. To do this the most infinite pains were taken, and no detail was too small to be neglected. Straight, horizontal, and vertical lines were avoided; the stylobate was curved in elevation, as was also the entablature, the columns had an inward inclination which was echoed in the architrave and frieze, while the abacus and corona projected forward. Professor Goodyear explains these refinements at length, but, briefly, their existence is solely due to their artistic value; they improve the appearance of the structure, and take away the hardness and rigidity of an exactly symmetrical scheme. In their use there was no exact rule. The stylobate was sometimes raised in a vertical curve, sometimes curved in plan. The entablature was generally raised at the centre, but in one temple, the little temple at Cori, the entablature has a convex curve in plan which would, when seen from below, give a depression toward the centre. To my knowledge these curves have not been used in modern work, but I don't see why they could not be. The laying out would be troublesome, but the expense would not be great, for it should be borne in mind that these so-called curves were not actual curves in the stone. They were composed of broken lines, and the difference would be so slight it could be taken up in the joints. The inclination of the columns has been done, quite often, I think. I myself have done it several times. The scheme was this: The columns of the Greek temple were inclined inward slightly, in the case of the Parthenon about 2¾ inches in the height of 34 feet 3 inches, the corner columns being inclined on the diagonal. The effect was to increase the pyramidal appearance of the building. The inclination was taken up in the upper and lower beds, the other beds being perpendicular to the axis of the column; this difference in the beds being very slight. There is no particular difficulty in the setting; a heavy wire is tightly stretched at a fixed distance from the column centre and having the desired inclination; on this wire a trammel will give the exact centre of each drum. The inclination, even with an order of less diminution than the Greek Doric, is imperceptible, but the effect is an improvement. The architrave and frieze naturally had an inward inclination, relatively greater than the inclination of the column, about 1 in 80; the greater inclination being used so that the lines of the architrave and frieze should be in harmony with the outline of the column, whose relatively great diminution was increased by its inward inclination. The abacus, however, did not follow this inclination; it had an outward inclination. I assume this was done to separate the abacus from the architrave, as from its forward inclination it would naturally be less in light than the architrave, and would become in tone more a part of the columns than of the more brilliantly lighted architrave above. This refinement seems really more necessary in modern work in stone than in the elaborately decorated Greek temple. It is a very noticeable fact that at a distance the heavy abacus does tend to count with the architrave, and seems to give a stepped outline to the bottom of the entablature.

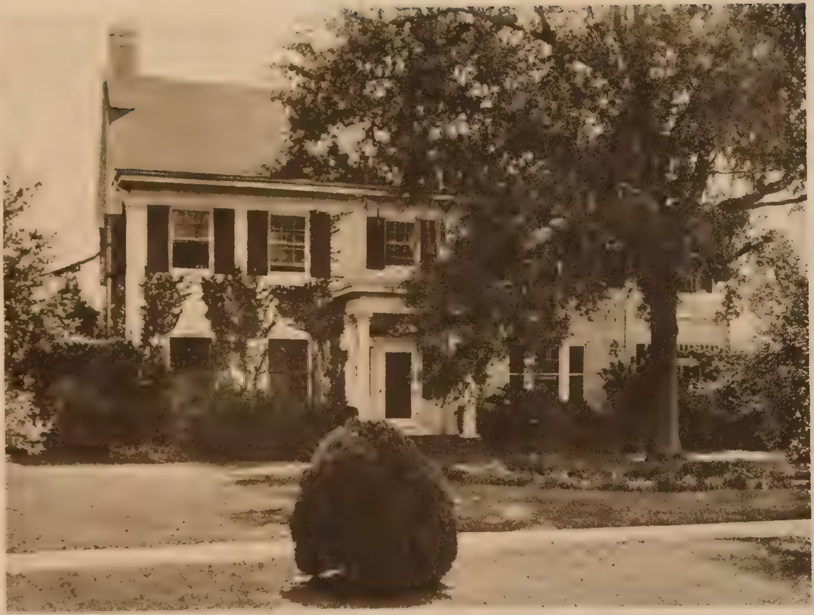
In conjunction with the inward inclination of the column is the slightly inward inclination of the cella wall. This inclination is slight, and its use in modern work is probably unnecessary. I myself don't see what effect is gained by it, but it is probably merely to accord with the inward inclination of the column axes, although if the face of the anta had an outward inclination, as Penrose says, I should think this outward inclination would, when seen across the corner, tend to nullify the inward inclination of the wall itself. This inclination of the cella wall contradicts the theory, often advanced, that the inward inclination of the columns was for the purpose of making the space between the columns and the cella wall approximately the same width at the bottom as at the top, which would not be the case if the column and wall were both vertical, due to the excessive diminution of the Greek Doric column. This idea always seemed to me entirely fanciful. It is very obvious on a drawing, but in reality it is impossible to stand in any position in which you could see the wall and column in the relation shown on the drawing.

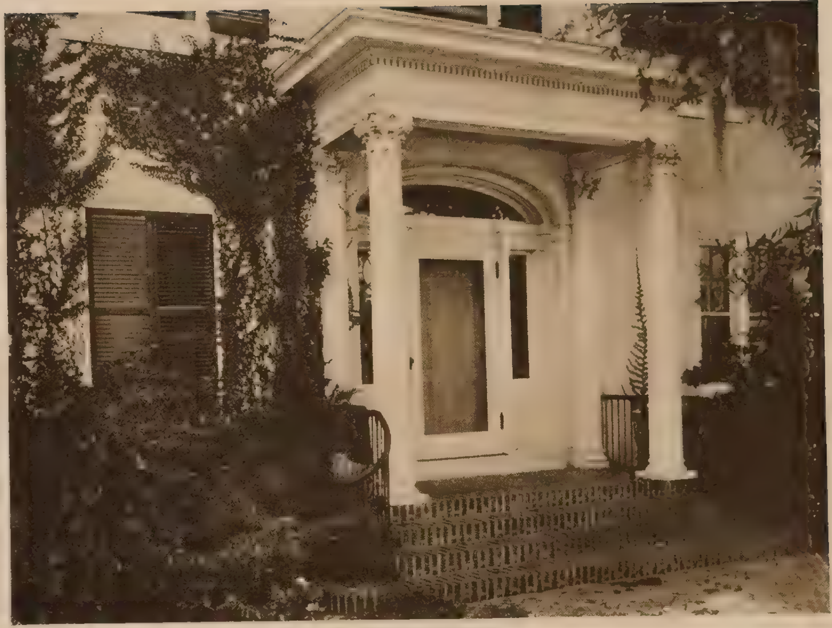
Another apparent refinement introduced by the Greeks in this best work was the slightly unequal size and spacing of the columns, particularly the columns of the flank. These irregularities are very slight, and are absolutely unnoticeable. They cannot be due to carelessness in execution, for the variant or builder's error is only two-one hundredths of a foot between the two fronts of the Parthenon, and it cannot be, as Penrose says, due to the disinclination of the Greeks to abandon an architrave stone that was very slightly smaller than it should be, or from difficulties in obtaining a number of stones of equal length. This would presuppose that all the architraves were cut before the stylobate was laid, an extremely unlikely proposition. It seems more in accord with the freedom of Greek work that slight irregularities were allowed, or even sought, in order to increase the artistic effect.

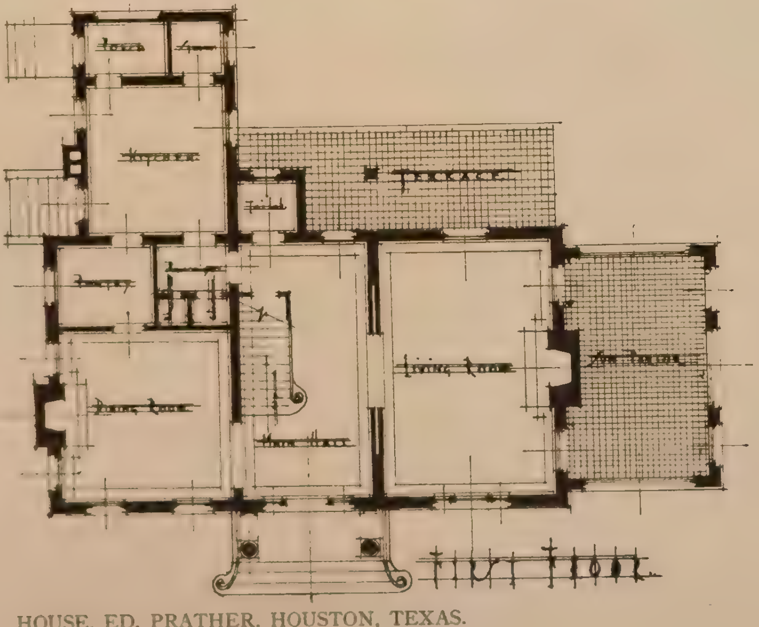
In connection with the pediment there is one fact that is generally overlooked: the raking cornice of the pediment is not the same as the horizontal cornice. It consists merely of the projecting fascia crowned by a cymatium; the mutules are not repeated nor is there any substantial bed mould; that happens because the pediment itself is completely filled with sculpture in very high relief with which the mutules would seriously interfere; the cornice is a mere frame or protection to the sculpture. In modern work the sculpture is usually omitted, and yet the face of the tympanum is kept in the same relative position in which the background of the sculpture is shown in the restorations. The result is to intensify the thinness of the cornice and cause a dark, unpleasant shadow at the corners of the pediment. Therefore in all cases where sculpture is not used there ought to be a bed mould under the fascia, and the face of the tympanum should be brought forward considerably from the relative location of the background of the sculpture to a plane at least over the face of the triglyphs, perhaps even more. This point is particularly true if the Roman Doric order is used, as the cornice here has more projection than the Greek Doric. There are practically no classic examples to follow, but generally, in this case, the metopes should be omitted, as in the Greek work; the effect is much more solid if this is done and if the projection of the Greek cornice is much reduced. The latter can only be accomplished by moving out the face of the tympanum beyond the frieze face. This is not noticeable in execution; in fact, this face can be advanced at least a third of the distance between the frieze face and the cornice fascia without bad effect; if the cornice is not very projecting, and if the detail is strong, it might be even advanced to half the distance. One other point, the acroteria: It is evident that most Greek temples had at the corners of their pediments acroteria of some sort or other, but the exact form they took is largely a matter of conjecture. Generally they were some form of anthemia, sometimes sculpture, human figures or animals; very possibly there was some religious or traditional significance attached to them; they hardly could have been used entirely for artistic effect. Personally, I have always felt they were better off the temple than on it. They seem a little frivolous and disturbing, particularly when seen, as they usually were, in silhouette.

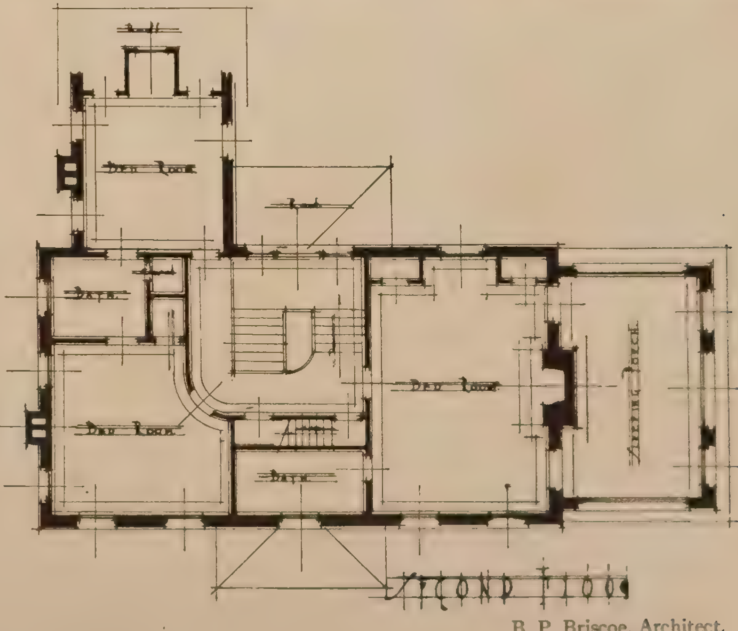
In this article reference has been made chiefly to the Greek Doric order, but in a general way the same principles apply to the Roman Doric. In the latter, however, the architrave face is generally over the upper column face, or approximately so. This is because of the relatively small projection of the abacus and its slight depth as compared to the Greek Doric. But in the case of pilasters the conditions are the same as in all orders, as has been hereinbefore explained; the architrave face is always beyond the pilaster face. As to the location of the triglyphs in regard to the corner column, there is only conjecture. Vitruvius says that the use of the order was abandoned for temples and porticos because of this inherent difficulty, and that in his opinion the triglyph should always be over the column centre. Vitruvius is not a very safe guide, as a rule, but in any event the Romans seemed to have used the order sparingly, and usually as an engaged order. In most instances the intercolumniation was proportionately wider than in the Greek Doric, and there were, consequently, two or more triglyphs over the intercolumniation instead of one, as in the Greek order. Vignola and the other Renaissance architects follow the ideas and rules of Vitruvius, and show the triglyph over the corner column, but it seems to me that this effect in a portico of any size would be most unfortunate. It would seem, also, that owing to the increased number of the triglyphs it would be easier and less noticeable to make an adjustment of the spacing in the Roman than in the Greek order. Perhaps the best way out of the difficulty would be to omit the triglyphs altogether in a portico or pediment. The Romans often used a plain frieze with monumental effect even in cases which presented no difficulties in the triglyph arrangement. In these cases the mutules are usually omitted. In my opinion a pediment would be much finer if the cornice did not have the excessive projection usual in the Roman Doric, particularly in the order as shown in the plates of Vignola. This is especially the case if the order is in stone; in wood or in stucco the excessive projection is more natural. In point of fact the Roman Doric has never the stony monumental quality of the Greek order unless the detail is greatly simplified, so that the order more nearly resembles what is called Tuscan in the restorations. This simplification of the order was generally used in great amphitheatres in Rome, and a modern example is the arcade of the Pennsylvania Station in New York.

A reminiscence of the Greek feeling is retained in the fluting. The flutes are not separated by a filet as might, perhaps, be expected from the design of the cap and the base, but finish in a sharp arris as in the Greek Doric. I have seen modern examples in which the filet was used, but the effect was not good. Just why this should be the case I don't know. Possibly, because the flutes when separated by a filet are deeper in section, and have consequently more shadow, and this perhaps tends to reduce the scale of the shaft. In any event, the effect is better if the shallow sharp arris fluting is used. I have seen this fluting used in pilasters, but here the effect is distinctly bad. In such cases there is naturally a filet at the corner for structural reasons so that the fluting is neither one thing nor another. The effect is bad and the pilaster should never be fluted.









HOUSE, ED. PRATHER, HOUSTON, TEXAS.

B. P. Briscoe, Architect.

Thebaid Architecture

By T. L. M. Meares

Illustrated with photographs by the author

THE Thebaid is the ancient district enclosing Karnak, Luxor, Der-el-Bahri, Medinet Habu, The Ramesseum, and Kurna.

Egyptian architecture dates back to a period far earlier than that of any other race, and for this reason it is strange that so little has been done for it as compared with the work which men like Mueller did for ancient Rome and Greece.

THE GREAT SOUTHERN GATEWAY, KARNAK

Its size may be judged by a comparison with the man standing at the foot of the left-hand upright.

Egyptian sculpture and architecture was determined at a period when no other nation was so far advanced, consequently their art was not influenced by foreign importations and their history can be traced more definitely than that of any other nation.

Most of their edifices were built somewhat carelessly, and their foundations, until up to the latter portion of the Ptolemaic period, were of the poorest description. This fact is borne out by the condition of the temples at Edfon and Dendereh, which were built in the latter period and which are the most complete of any of the Egyptian edifices. The materials chiefly used for the body of these great edifices were limestone and sandstone, and it was only when the choicest and most expensive materials were required that granite was used. Granite, however, was generally used for isolated objects, such as obelisks, sarcophagi, etc., or, in other words, for the sculptors rather than for the architects. Mud bricks were also used for buildings other than temples and were quickly and cheaply made from Nile mud.

The rulers of Egypt were great taskmasters, and they had unlimited labor. Their giant monoliths could be placed on rafts at Syene (Assonan) and floated down-stream and then, if it was required to erect them some distance from the stream, they were placed on wooden sledges and drawn in some cases by as many as three thousand slaves to their destination.

The ruins of Karnak lie on the eastern bank of the Nile. The series of temples built within its walls covered the period from about 2400 B. C. to 200 B. C. The Gateway of Ptolemy IX affords fine opportunity for study, as it shows clearly that in spite of the Persian, Macedonian, and Greek invasions of Egypt, the architects still retained the same style as in their earlier buildings. The bas-reliefs show Ptolemy making offerings to Amen, Isis, Ptah, Ra, and other deities. On the overhanging cornice is shown the winged sun Horuhudit, so frequently used as the finishing touch to Egyptian buildings.

Probably the most modern of all the Egyptian methods of decoration is that of the sphinx, or sacred ram. These generally flank the causeways leading to the various entrances of their temples. They always face inward and yet, although the ram was sacred to north Egypt, in Thebes we find no signs of their ever being placed inside the temples. Their use, therefore, in these avenues is probably entirely confined to ornamentation, and has no religious significance.

Karnak stands out as the finest and most remarkable series of ruins in the world. Amongst these, however, we find a few examples of the high standard of work such as the great Hypostyle Hall, or Hall of Pillars. In extent it is the largest and most spacious hall ever built by the Egyptians, and measures 340 feet by 170 feet by 76 feet

JOSEPH'S GRANARIES, THEBES

The wonderful preservation of these granaries, made from mud bricks, is a fine tribute to the dryness of the climate. The ancient millstone is seen in the foreground.

THE RAMESSEUM, THEBES

The heads of all these columns were destroyed during the early Greek and Roman invasions. The head seen at the foot of the centre column has no connection with the ruins in view.

THE GREAT HYPOSTYLE HALL, KARNAK
Note the fine preservation of the writings and the early stone window

high, containing in all 134 massive pillars. Twelve of these are the largest ever used in any building in the world, and measure 76 feet high, 11 feet 10 inches in diameter, 33 feet in girth. They are placed in the centre of the temple, supporting the main weight of the roof, which on each side of this centre court is about 33 feet lower in height. The hall was begun about the year 1640 B. C. by Rameses I and continued by his son Seti I, and finally completed by his grandson Rameses II (The Great), about 1423 B. C. Apart from its hieroglyphic writings and embossed inscriptions, this hall is also remarkable as containing the only known example of a stone window over the age of 3500 years. At the far end of the hall may be seen the obelisk built by Thothmes I, about 1800 B. C. To realize the greatness of this mighty structure one must needs have seen it, but it may be of help to draw a comparison and to say that the cathedral of Notre Dame in Paris would easily stand on the surface covered by this hall, which in itself is only a portion of this great temple.

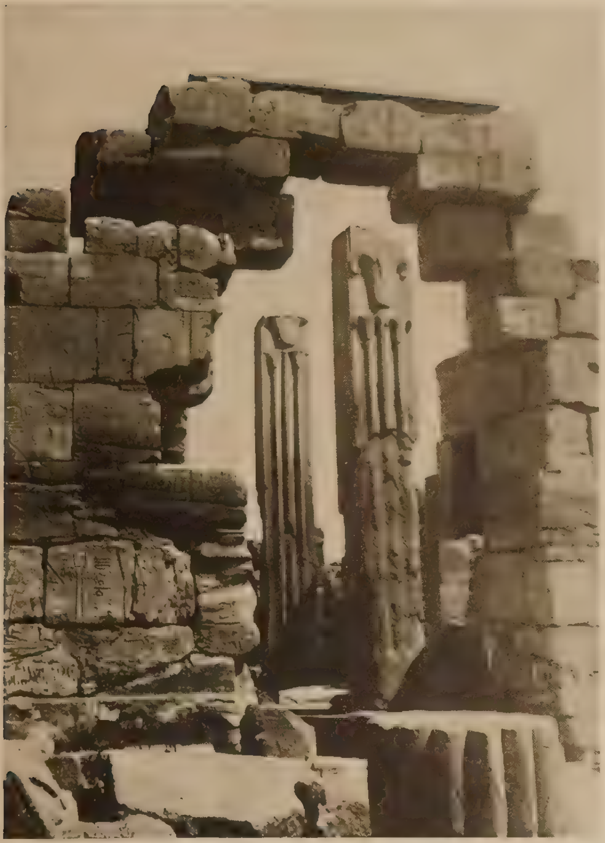
Another form of decoration common to the twelfth, fourteenth, and fifteenth dynasties is what is now commonly known as the lotus column. The lotus-plant was in those days very common in Egypt, and, due probably to its numerous uses, became sacred. Thus when architects were searching for decorative art we find them utilizing the shape of an unopened lotus-blossom (which is rather like that of an inverted bell). In Karnak we have a very fine example of this in the temple of Usertesen I (2900 B. C.). Here the columns mark the spot where once the people believed that a divinity resided, and inscriptions to this effect may still be traced. Another example shows also the famed papyrus column described by Strabo as "a peeled wand surrounded by a plume of feathers"; the significance of these two emblems in this picture is that they represent the joining of upper and lower Egypt, which took place under Menes in 3400 B. C., the lotus being the sacred symbol of the Thebaid, or Upper Egypt, while the papyrus represented the Delta, or Lower Egypt. Another shows the development of the lotus from the decorative to the structural feature. Karnak is still undergoing extensive excavation work. Until 1892 A. D. a large portion of it was covered by the modern village of Luxor, and as can still be seen there are still the remains of a modern mosque in its very centre. Although the ordinary dwelling-houses can easily be removed, it is doubtful whether European reverence for the Mohammedan religion will allow of the mosque being removed in order to complete the work of excavation.

The temple of Der-el-Bahri (Convent of the North), built by Queen Hatasu, is as unique in conception as it is notable in construction, and in its general arrangement is without parallel in Egypt. It rests way back against the precipitous walls of the mountains of Libya, and is built in a series of terraces, while large portions of the temple are subterranean. The general arrangement of the inner temple is rather like that of the apsidal chapels so common in European cathedrals.

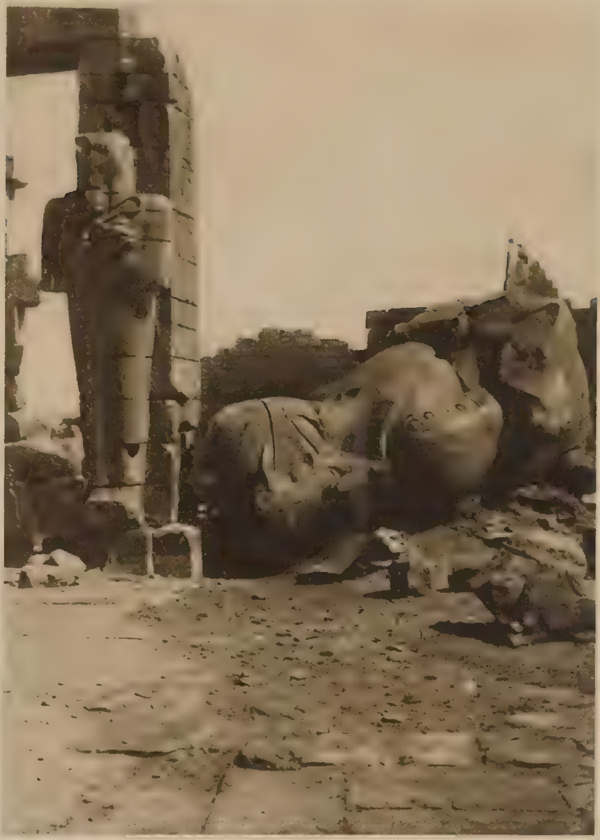
In the previous reign Thothmes had led his victorious armies through the lands of the Medes and Persians, where

THE TEMPLE OF DER-EL-BAHRI
The flat-sided columns as opposed to the usual cylindrical type is of special interest. The gateway of Thothmes II is in the background toward the right.

THE TEMPLE OF LUXOR
This photograph shows a portion of the west colonnade.



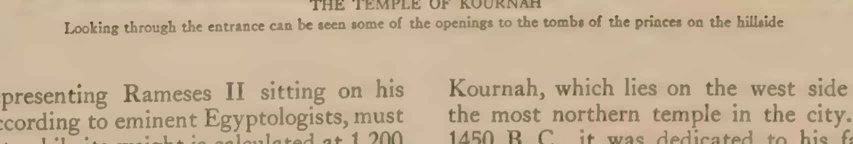
THE LOTUS AND PAPYRUS COLUMNS, KARNAK
The lotus is on the left and papyrus on the right. Toward the top of the left-hand pillar of the arch is seen a member of the community paying homage to Rameses, who is sitting on the throne.



THE THOUSAND-TON COLOSSI OF RAMESES, THEBES
A portion of the inscription can be seen on the right arm.

the "terrace" architecture was in vogue, and therefore this style of architecture probably emanated there. This is, therefore, the first example of outside influence altering the style of the true Egyptians.

Another interesting portion of ancient Thebes is the Ramesseum, which lies on the western side of the Nile. It was built as a cenotaph by Rameses II to himself. The various hieroglyphics as is usual on all ancient Egyptian monuments described his achievements. The statues built into the main columns represent Rameses as Osiris.



THE TEMPLE OF KOURNAH
Looking through the entrance can be seen some of the openings to the tombs of the princes on the hillside

Here also is lying the remains of the greatest statue ever carved from one single piece of stone by the Egyptians. The desire to destroy, on the part of some conqueror, has, however, unfortunately robbed the world of one of its finest sculptural monuments, representing Rameses II sitting on his throne. Its height, according to eminent Egyptologists, must have been over 57 feet, while its weight is calculated at 1,200 tons. Furthermore, it rested on another single block of granite weighing over 1,000 tons. It was carved in the granite quarries nearly 150 miles distant and then floated down the Nile.

A further interesting type of architecture seen in the Ramesseum—that of mud bricks—recalls the work of the children of Israel. Lying some fifty yards north from the main temple can be seen the granaries which Joseph, as overseer for Pharaoh, erected for the storage of corn prior to the seven lean years. These ancient granaries were almost always built with round arches, though a few were built in later periods with the more pointed arch. The walls were usually of great thickness and extremely well constructed, in order to preserve an equable and low temperature to keep the provisions in good condition.

The last portion of Thebes under review is the Temple of Kournah, which lies on the west side of the river and is the most northern temple in the city. Built by Seti I in 1450 B. C., it was dedicated to his father. It is of very sombre appearance but is a good example of the work of the period.

Concrete Construction

By DeWitt Clinton Pond, M.A.

FOURTH ARTICLE

THE determination of loads on interior columns of the northeast section of the 395 Hudson Street Building is a comparatively simple matter. The unit floor loads, which have already been determined in the design of the wall columns, are multiplied by the areas carried by each column, and this area in the case of most of the columns is a square panel measuring 20 feet by 20 feet.

The first interior column to be designed will be column 59, which does not project through the ninth floor but which stops at the ceiling of the eighth story. The first load will be the ninth-floor load. The live load on the entire area is 40,000 pounds, and as there is no reduction of live load on this floor it is only necessary to add the dead and column loads to obtain the total. The dead load will be 50,000 pounds, and the total dead and live loads will be 90,000 pounds. To this must be added the weight of the column itself, as in the case of all the wall columns which were designed in the last article. Because this column is used to support flat-slab construction its diameter must be one-twelfth of the span length. The span length in this case is 20 feet, and the diameter is 1 foot 8 inches. The story height was given in the last article as 13 feet. Knowing the diameter and height of the column it will not be difficult to determine that the load is 5,000 pounds. The total load on the column, including its weight, will be 95,000 pounds.

Although this column would be designed, under ordinary circumstances, with spiral reinforcing, in this case the reinforcing in the upper-story section will be the same as in the exterior columns—vertical steel and hoops. The reason for this is that the area of the column is so great, on account of its diameter being as required by law, that the concrete alone would support the load and only the minimum amount of reinforcing is required. The area of the column is 314.16 square inches, and one-half of 1 per cent of this is 1.57 square inches. This can be made up of four ⅝-inch bars. The hoops must be spaced 15 times the size of a vertical reinforcing rod, or 15 × ⅝ = 9¼ inches.

The upper section of column 59 will be, therefore, 1 foot 8 inches in diameter, and will be reinforced with four ⅝-inch rods and ¼-inch hoops spaced 9¼ inches on centres.

As the live load increases to 200 pounds per square inch on the eighth floor, and for all floors below until the first floor is reached, the dead load will also increase, and the total dead and live load will be 135,000 pounds. There will be no increase in size in the column, so it will weigh the same as before, or 5,000 pounds, and the total load per bay will be 140,000 pounds. The total load on the column at the eighth floor will be 95,000 + 140,000 = 235,000 pounds.

This section of the column will be reinforced with spiral steel and vertical rods. If 1 per cent of vertical steel is used, and the area within the spiral is 201 square inches, the area of vertical steel will be 2 square inches, and this can be made up with four ⅞-inch round rods. The combined area of these rods will be 2.4 square inches, and if cold-drawn steel is used in the reinforcing of the column this will support 2.4 × 5,800 = 13,920 pounds. The value of 5,800 pounds per square inch is taken for the cold-drawn steel on the basis that a rich—1, 1½, 3—mixture will be used and 2 per cent of spiral reinforcing.

The concrete will support 201 × 600 = 120,600 pounds, and the vertical steel and concrete will carry 120,600 + 13,920 = 134,520 pounds. The load has been found to be 235,000 pounds, and therefore there will be 100,480 pounds to be supported by the spiral steel. Assuming that there will be 2 per cent of steel used, there will be 201 × 2 × .02 × 20,000 = 160,800 pounds added to the strength of the concrete. This is too much, and it will be necessary to have a percentage of only 1.25 per cent. In order to find the pitch of the spiral it will be necessary to assume the diameter of the spiral steel, and this will be assumed to be ⅜-inch round steel with a cross-sectional area of .110 square inches.

By substituting in the formula given below it will be possible to determine the pitch.

$$p = \frac{4 \times \text{area of spiral steel}}{\text{percentage} \times \text{effective diameter}}$$

$$p = \frac{4 \times .11}{.0125 \times 16} = 2\tfrac{1}{4} \text{ inches}$$

The only difference in the loads added at the lower floors is that the live loads are reduced 5 per cent, at each of them, but as the column increases in diameter, and its weight increases in proportion, there is not much variation in the loads at each floor, until the first floor is reached. In the ceiling over the wagon courts at the first floor there will be located crane beams which will carry motor-operated hoists, which will be capable of lifting 5 tons each. On this account there will be added to the column load at the second floor a load of 25,000 pounds. It will be recalled that in the first article of this series attention was called to the fact that there will be a live load of 1,000 pounds per square foot on this part of the first floor. Therefore, on the basement section of this column there will be a much larger load brought to it at the first floor than at any other floor. In the following table of loads it will be noticed that the load added at this floor is even more than twice as large as that at the second floor, and this is larger than any other load.

STORY	TOTAL LOAD PER STORY	TOTAL LOAD	OUTSIDE DIAM.
8	95,000	95,000	1′ 8″
7	140,000	235,000	1′ 8″
6	138,000	373,000	2′ 0″
5	137,000	510,000	2′ 2″
4	136,000	646,000	2′ 6″
3	134,000	780,000	2′ 8″
2	132,000	912,000	2′ 10″
1	168,000	1,080,000	3′ 2″
B	385,000	1,465,000	3′ 8″

An item that was not touched upon in the discussion of the design of the seventh-story section of column 59 was the determination of the effective diameter, as this was determined in advance by the requirements of flat-slab construction. In the sixth-story design, however, it will be noticed that the diameter increases, and it may be well to investigate the method of determining the required diameter.

There is nothing very complicated about this method. It consists of simply dividing the load by 1,146 and taking the square root of the result. The load on the sixth-story section is 373,000 pounds. Dividing this by 1,146 gives the result 325. The square root of this is approximately 19 inches. This is the effective diameter, and the outside diameter will be 4 inches greater than this, or 23 inches. For the sake of even figures this diameter is taken as 2 feet, as shown in the table above.

The area of the concrete within the spiral is 314 square inches. One per cent of this will be 3.14 square inches, and this can be made up by using four 1⅛-inch round bars for vertical reinforcing. Actually these bars will have an area 3.97 square inches, and a supporting strength of 23,000 pounds. The concrete will support 314 × 600 = 188,400 pounds, and with the vertical bars will support 211,400 pounds. As the total load is 373,000 pounds there are still 162,000 pounds to be carried. Assuming that there will be 2 per cent of reinforcing furnished by the spiral steel, the additional strength allowed to the concrete will be 314 × 2 × .02 × 20,000 = 251,200 pounds, and as this is too much it can be determined that there will be necessary 1.29 per cent. If it is assumed that $\frac{7}{16}$-inch spiral wire will be used, it will be a simple matter to substitute the proper amounts in the formula given above to obtain the pitch.

$$p = \frac{4 \times .153}{.0129 \times 20} = 2\tfrac{3}{8} \text{ inches}$$

In a similar manner all the reinforcing can be found for the other stories, but as the method has been shown the only other sections which will be designed will be the first-story and basement sections.

By referring to the schedule it will be seen that the load at the second-floor level, but which includes the weight of the first-story section of column, is 1,080,000 pounds. By the calculations given above it can be found that the diameter of this column should be made 3 feet. For practical considerations, which will be given below, the column was actually made 3 feet 2 inches in diameter. The effective diameter is therefore 34 inches, and the diameter of the concrete within the spiral is 907 square inches, and the area of vertical steel 9 inches. This last area will be made up by eight 1¼-inch round bars, which will have a combined area of 9.81 square inches, which will support 5,800 × 9.81 = 56,932 pounds.

The concrete will have an area of 907 square inches and a supporting value of 544,200 pounds, and the combined concrete and vertical steel will support 601,132 pounds, which will leave 478,868 pounds, which must be added to the concrete.

If the percentage of spiral steel is 2, then the additional strength of concrete will be 726,300 pounds, so the percentage used will be 1.18. Assuming that ½-inch round steel will be used in the spiral the pitch will be 1¾ inches.

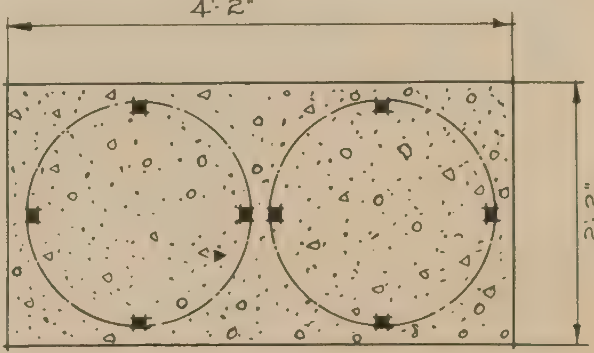
At the first floor the heavy load increases the total load on the column to 1,465,000 pounds. By the methods given above, the diameter can be determined as 3 feet 4 inches. As before, however, the actual outside diameter will be made larger, or 3 feet 8 inches, and the effective diameter will be 40 inches. The area of the concrete within the spiral will be 1,257 square inches, and the required area of vertical steel will be 12.5 inches. If 11 round bars 1¼ inches in diameter are used, their combined area will be 13.5 square inches, and their supporting value will be 78,300 pounds. The concrete will support 754,400 pounds, and the combined materials will carry 832,700 pounds, which will leave 632,300 to be taken care of by the spiral steel. If 2 per cent is used, the additional strength of the concrete will be 1,005,600 pounds, so it will be necessary to use only 1.25 per cent. If ½-inch wire is used the pitch will be 1⅞ inches.

It will be noticed that the diameters are large and the spiral wire small. The reason for the use of small spiral wire is that at the time the building was being designed this was the only wire which could be procured. Because of this it was necessary to use less than 2 per cent of spiral wire and to have a pitch which was fairly small, and also to have a greater diameter of column than would be found under ordinary circumstances.

Column 60 projects through the eighth floor and supports the roof construction above. The roof area carried by the column measures 40 feet × 20 feet, as other columns stop at the ceiling of the eighth story, and 40-foot spans occur in the roof beams and girders. The live load on the roof is 40 pounds; the dead load, which is determined on the basis of beams and girders which have been tentatively designed, is taken as 100 pounds. The total of the dead, live, and column loads can be found to be 117 pounds, and the same type of reinforcing will be used to support this as was used in the case of column 59. The steel will consist of four ⅝-inch square rods, and ¼-inch square hoops spaced 9¼ inches on centres. The mixture used for this upper section is a 1, 2, 4 mixture, as was used in the upper portion of the first. Below the ninth floor, however, the richer mixture is used. By referring to Fig. VI in the second article it will be seen that column 60 is made square in the ninth story. As this is an office floor the reason is obvious.

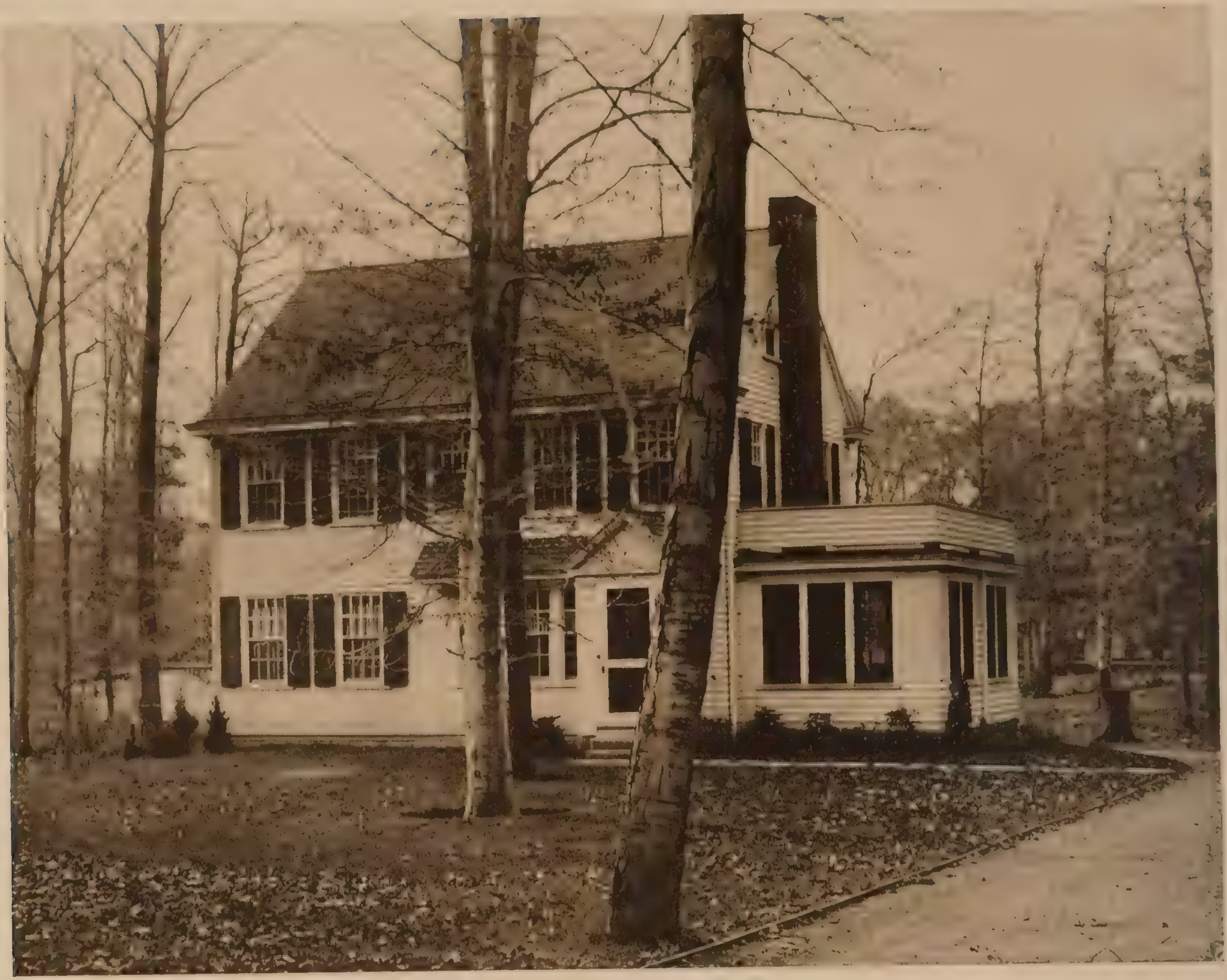
Reinforcing with vertical steel and hoops is the best method of adding steel to a column of this kind. The area of this section, which is 16 inches square, is 256 square inches, and it is reinforced with four ⅝-inch square bars, which have a total area of 1.56 square inches, and with ¼-inch hoops, as has been stated above. It will be found that this section is capable of supporting 138,000 pounds, which is more than the actual load.

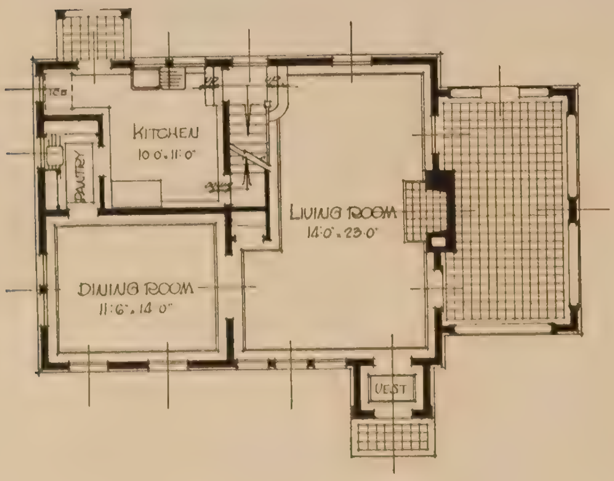
Below the ninth floor the column is reinforced with spiral steel, as was column 59. The loads are about the same as those given for the last column, and about the only difference is the load carried at the roof. Because of this additional load the total at the first floor, which is carried



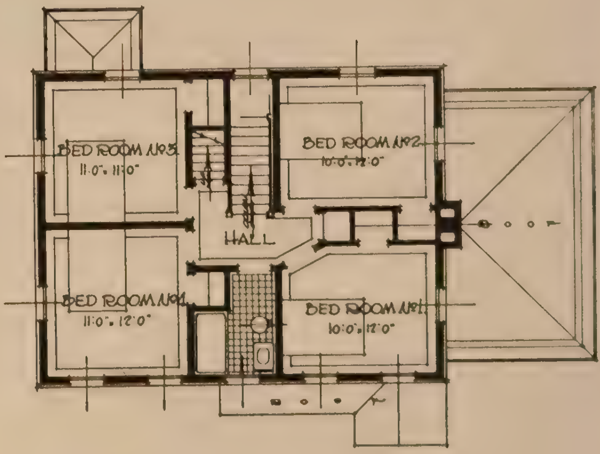
·DETAIL · OF · COL· 61 & 70

·FIGURE· X·





FIRST FLOOR PLAN



SECOND FLOOR PLAN

HOUSE AND PLANS, GUY C. FOSTER, TENAFLY, N. J.

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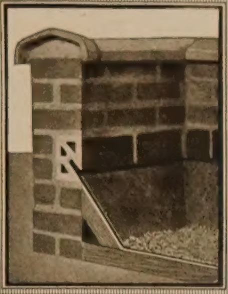

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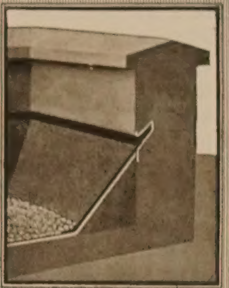

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For general distribution, Architectural Service Sheets Nos. 7, 8, and 9, show these Flashings in detail. Copies will be gladly furnished free by our nearest office by the basement section, is 1,526,000 pounds, and the column is made 3 feet 10 inches in diameter.

Columns 69 and 70 are similar, and their design is interesting, as at the first floor these columns are designed with rectangular sections. This is done so that they will not project into the wagon court, as shown in the architectural plan in the first article of this series. The method of reinforcing, shown in plan in Fig. X, is different from that used in the average rectangular column. Two spirals are used and placed adjacent to each other, and these are enclosed within the rectangular section. The load brought to each column at the second floor is 1,080,000 pounds, which is the same as that on column 60. The design is determined as if this load were split in half, and each half carried by a single spiral. The load on one spiral then becomes 540,000 pounds, and by dividing this load by 1,146 and extracting the square root, the effective diameter is found to be 22 inches, which will make the outside dimension or width of the rectangle 2 feet 2 inches. The length will be 4 feet 2 inches, which allows 2 inches between the spirals and 2 inches outside of each for fireproofing. The effective area within the spiral is 380 square inches, and the vertical steel will have to have an area of 3.8 square inches. If four 1⅛-inch round bars are used in each spiral their area will be 3.96 square inches, which will support 23,000 pounds. The concrete will carry 228,000 pounds, and the two materials will support 251,000 pounds, leaving 289,000 pounds to be added to the strength of the concrete by the spiral steel. If 2 per cent is used this will add 304,000 pounds, and it will be necessary to use only 1.9 per cent. If ½-inch round wire is used its area will be .196 square inch, and the pitch will be 1⅞ inches.

As all other columns in this part of the building are similar to columns 59 and 60, there will be no more need to discuss them, and in the next article the design of the footings under them will be taken up.

Announcements

Edwin F. Simpson and Rolland L. Githens announce that they have formed a partnership for the practice of architecture, with offices at 869 Reibold Building, Dayton, Ohio.

W. E. Gore, Architect, Paducah, Ky., now occupies his new offices in the City National Bank Building.

The handsome catalogue of the Richardson & Boynton Company bears the title "Comfort and Economy in Heating." The four good ways are shown, heating by warm air, heating by steam, heating by vapor-vacuum pressure, heating by hot water, and the best equipment for these methods.

Owing to the extended territory in which he is now practising, and to his desire to render still more efficient service to his clientele, Mr. G. Lloyd Preacher, architect and engineer, wishes to announce the association with him of Messrs. Geo. Harwell Bond, J. F. Wilhoit, and Nicholas Mitchell, to practise under the name of G. Lloyd Preacher & Co., architects and engineers, with offices in Healey Building, Atlanta, Ga., and Masonic Building, Augusta, Ga.

The Magnesia Association of America sends us an attractively illustrated and printed catalogue, "Defend Your System with 85% Magnesia Pipe and Boiler Covering," showing its practical uses in various ways. As a conserver of heat its reputation and proved utility are well known the world over.

The General Fireproofing Co., Youngstown, Ohio, have sent us a Review of the Metal Lath Association, written by the president, W. B. Turner, showing what has been done in investigation along the following lines: Fire Tests, Weather Tests, Distortion or Structural Tests, Acoustical Tests, Thermal Conductivity Tests. The value of metal lath as a fire-resistant needs no argument.

The United States Radiator Corporation, Detroit, Mich., has issued the sixth edition of their catalogue, showing their complete line, with price lists. It contains valuable information regarding the proportion of radiation for both steam and water heating, size of rooms, etc.

We are in receipt of the handsome catalogue of the Roddis Lumber and Veneer Co., showing a complete line of their Standard Flush veneered doors. They are of five-ply construction, and are made to resist all variations due to heat and cold. Their method of laminated construction prevents shrinking and swelling. Their general sales office and factory are at Marshfield, Wis., with branch offices in all important centres.

Joseph Hudnut, architect, begs to announce that he has moved his offices from 41 Union Square to 51 West 10th Street, New York City.

The Chas. T. Main Engineering Organization, Boston, Mass., sends us a catalogue showing a number of their important hydroelectric developments.

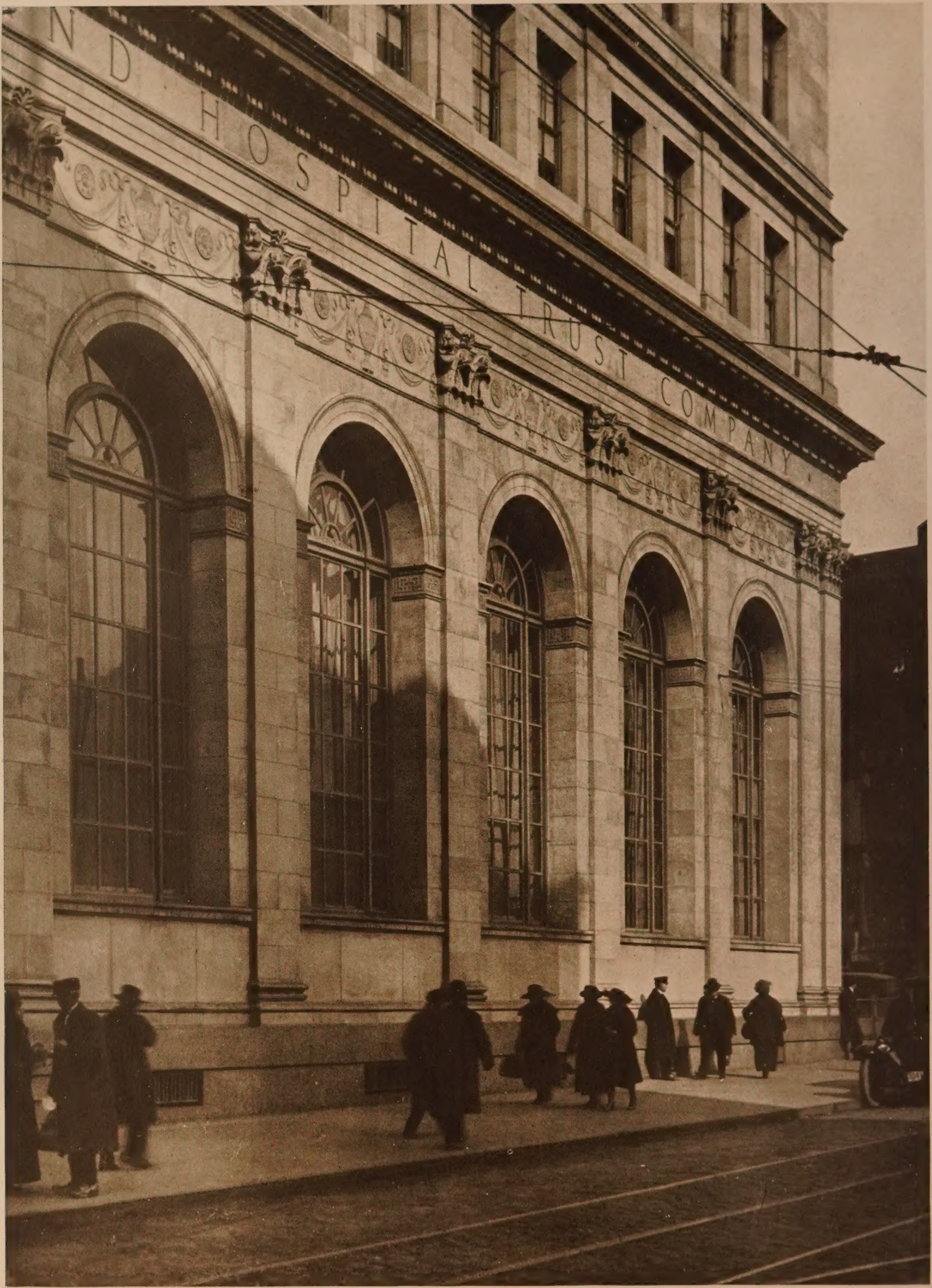
The colored plates and the drawings of details in the pamphlet issued on "Architectural Granite" by the National Building Granite Quarries Ass'n, Boston, contains much valuable information. The colored plates are remarkably good reproductions of both the color and texture of the various granites.

Adamson Now Makes Tanks and Arc-Welded Products.—The Adamson Manufacturing Company, East Palestine, Ohio, have added a new department for manufacturing all kinds of storage, pneumatic, and pressure tanks, welded pipe, battery casings, evaporators, condensers, and a large line of arc-welded products.

The exhibition of "Preliminary Sketches for the War Portraits" now on view at the Metropolitan Museum, recently shown at the Arden Gallery, 599 Fifth Avenue, was most interesting and attracted much attention.

These sketches were made from life by the Group of American Painters selected by the National Art Committee to paint a restricted number of distinguished men who by their untiring efforts, vision, and sacrifice have been able to marshal the resources of the world against its common foe, and have an interest for all students and art lovers.

They were made under exceptionally interesting conditions, as the painters were given unusual opportunities to study their sitters, both at their homes and during official gatherings.



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